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Milk Quality Surveys in California: 1974 and 84[1]

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[1]Research supported in part by grants from the California Milk Advisory Board and the Dairy Council of California, the latter administered by the National Dairy Council.

INTRODUCTION

The quality of milk and dairy foods directly affects consumer acceptance. Products that spoil prior to use by consumers are undesirable, and products with an objectionable flavor deter consumers from purchasing the products in the future. Persistent quality deviations may turn consumers to other products or brands, or even to non-dairy food products.

Various workers have surveyed the quality of dairy products in retail stores and concluded that there is room for quality improvement (1,2). Regulatory agencies and dairy plant personnel rarely sample products in retail stores where consumer purchases are made. We therefore undertook, in 1974, a limited survey to determine the quality characteristics at retail of milks produced in California. This survey provided a limited data baseline for more comprehensive surveys conducted in 1981 and 1984, during which time we not only assessed the quality of products, but also the influence of fluorescent dairy case lighting on the two light-sensitive vitamins, A and riboflavin, in milk packaged in plastic containers. This paper reports the results of these surveys.

MATERIALS AND METHODS

1974 Survey

Santa Clara County Health Department personnel, during routine performance of their duties, collected samples of retail milks available in their jurisdiction, an area centered on San Jose, California. The samples were collected at random from dairy cases in retail stores over the course of five months and transported under refrigeration back to Santa Clara County Health Department laboratories in San Jose. The samples were analyzed for bration back to Santa Clara County Health Department laboratories in San Jose. The samples were analyzed for bacterial count using standard methods (8), aseptic subsamples were then placed into sterile containers, then the flavor was evaluated by three experienced judges. The subsamples were delivered under refrigeration to laboratories at UC Davis, stored at 7°C, and examined daily until they were deemed spoiled according to a sensory evaluation.

1981 and 1984 Surveys

From 10 to 12 fluid milk samples, collected from the dairy case, were purchased from randomly selected retail outlets throughout California. After samples were placed in a paper or plastic bag, they were placed with ice in an insulated container. The time from purchase to placement in the insulated cooler box was usually 10-15 minutes. Samples arrived under refrigeration within eight hours at the authors' laboratories for flavor analysis, or were analyzed locally if too far from Davis. If the samples were analyzed locally, subsamples were prepared as outlined in the 1974 survey protocol.

Sampling patterns were based on California consumer purchasing patterns. For example, 85% of the milk sold in California is purchased in large markets. Also, 65% of all milk volume is packaged in plastic, one-gallon containers; the remaining 35% is packaged in paper cartons. We therefore adjusted our retail purchasing patterns to reflect these and other purchasing habits of the average consumer in California.

All flavor analysis were done on a five point scale, where 0 = no defect; 1 = questionable; 2 = slight intensity of defect; 3 = definite intensity; and 4 = pronounced intensity.

For the 1984 survey we measured shelf-life on samples or subsamples that were stored at 7°C and flavor-evaluated until spoiled. Samples were evaluated daily until spoilage was noted.

Standard plate counts were performed by standard methods (8) on the date of purchase (1974 and 1984 surveys) and again on the sample pull date. Retinol concentrations (1984 survey) were measured in triplicate using Senyk's procedure (11) on light-protected subsamples in insulated packers. Retinol standards also were run at irregular intervals throughout the survey to ensure accurate analyses. Using Hand's procedure (6) riboflavin concentrations (1981 and 1984 surveys) were measured within 24 hours of purchase on the same subsamples used for retinol analysis. All data were analyzed statistically using the breakdown routine of the SPSS software package available on the campus computer (9).

RESULTS AND DISCUSSION

In the three surveys, more than 50% of the samples lacked objectionable flavors that could be detected by experienced dairy judges at the time of purchase (Table 1). In 1974, the predominant off-flavors were oxidized, feed cooked, and fruity. In 1981, the predominant off-flavors were light-activated, feed and stale. In 1984, the predominant off-flavors were light-activated and stale.

In 1974, the predominant off-flavor was oxidized, due to lipid oxidation. This defect was found predominantly in nonfat milk which is particularly susceptible. Little light-activated flavor was noted, principally because little milk was then packaged in plastic containers (less than 5% by volume). Milk packaged in paper is not immune from light-activated flavor, since about 4% of the paper packed samples in 1981 and 0.5% in 1984 were criticized for this defect. The light-activated flavor was found mostly in milk from paper containers stacked next to the fluorescent tube in the dairy case. Almost half of the samples packed in plastic in the 1981 survey were criticized for having light-activated flavor (Table 1). Efforts by California dairy processors to reduce the light exposure of product in the dairy case reduced the incidence of light-activated flavor in the 1984 survey. Improvements included installation of plastic shields over fluorescent tubes, which minimize the emission of those wavelengths known to cause light-activated flavor; stocking to ensure more rapid turnover of products in the dairy case; elimination of fluorescent tubes from the dairy case; and installation of fluorescent tubes with lower emissions in the range that cause light-activated flavor.

The increase in stale flavor between 1974 and 1981 might reflect the increased sales of solids-fortified milks and solids not-fat-fortified lowfat and nonfat milks, which have longer shelf-lives. Most of the stale defects were noted in solids-fortified lowfat and nonfat milks. The decrease in cooked flavor between 1974 and 1981 is principally an artifact of the smaller number of processors sampled in the 1974 survey. The decline of feed flavor between 1974 and 1984 is probably attributable to an improvement in raw milk quality (Bruhn, unpublished). Only one plant in 1974 used a vacuum treatment to remove feed flavors; none did in the subsequent surveys. It must be remembered that strong flavor defects, e.g. light-activated flavor, can mask other more subtle defects. Thus, the absence of one defect, or its decline or rise between surveys, does not necessarily indicate an absence or trend; the defect may still be present but masked by a more dominant flavor.

The frequencies of flavor intensities determined at the time of purchase are tabulated in Table 2. It is our feeling that samples with a flavor intensity in the "slight" category or less would not likely be noticed by consumers, who normally drink the product uncritically. Samples with flavors in the "definite" or pronounced categories however, would more likely be noticed by consumers. These samples would be deemed objectionable and would not be consumed, or consumption would be reduced. Given these intensity parameters, we noted a decline from 1974 to 1984 in the percent of samples with flavor defects in the "definite" to "pronounced" flavor intensity categories. The increase noted in the 1981 survey was caused, in part, by the large number of samples with light-activated flavor (LAF), which declined from 1981 to 1984 (Table 1).

When we examined the flavor intensities by the container types, (Table 1) it became obvious that LAF pre-

TABLE 1. Proportions of various off flavors in retail milks in California.

Area	South Bay - 1974[1,2]		California - 1981[3]			California - 1984[4]	
Package	Paper	Paper	Plastic	All	Paper	Plastic	All
Off Flavor							
None	50	61	40	51	88	45	71
Cooked	11	4	0	2	1	1	1
Feed	13	10	12	11	2	2	2
Oxidized	14	2	2	2	0	1	0.3
Light Activated	3	4	45	22	0.5	48	19
Fruity	9	8	0	5	2	1	2
Stale	0	11	1	6	6	2	5
Rancid	0.5	0	0	0	0	0	0

[1]At the time of this survey, less than 5% of California milk was packaged in plastic.
[2]n=635.
[3]n-304; data from reference 10.
[4]n=352.
[5]Represents the 1-gallon untinted container.

TABLE 2. Flavor intensity frequencies for milk quality surveys.

Year	1974	1981[1]	1984 Surveys	
Flavor Intensity	Percent of Samples			
None	49	50	71	57
Questionable	6	4	7	5
Slight	29	26	14	22
Definite	13	15	7	13
Pronounced	3	5	1	3
Definite and Pronounced	16	20	8	16

[1]Data from reference 10.

dominated in plastic containers. Our data suggests that if LAF were reduced in milk packaged in plastic, then there would be little difference between flavor intensities for milks packaged in either container (Table 3). How significant are the flavor intensities to the average consumer? For the three surveys conducted during the last decade, only 13% of the samples from paper cartons (Table 3) examined by expert dairy judges were scored "definite" to "pronounced." If we assume that members of the general public probably cannot detect an off-flavor in milk until it has an intensity that is greater than "slight," then 87% of the market milks in paper containers examined were acceptable to the buying public at the time of purchase. When broken down by container type, 75% of the milk packed in plastic and 84% of the milk packed in paper would have flavors that are acceptable to the customers. These acceptance figures, of course, depend on the premise that all flavors are objectionable when their flavor intensities exceed "slight," an assumption that has not been substantiated by direct consumer research.

Barnard (2) suggested that the industry should strive for a 14-day shelf-life under good handling practices. "Shelf-life" is defined here as the time from bottling to spoilage. Since we are unable to determine processing date, we used the carton codes to determine the time from pull date to product spoilage. The number of days from pull date to spoilage averaged 5.4 (with a standard deviation of 3.7) for all samples examined in 1984 (Table 4), while the number of days from purchase to spoilage averaged 13.1 in 1974 and 11.2 for all samples examined in 1984 (Table 5). Shelf-life differences between retail milks packed in paper or plastic are negligible, as are differences among products.

Industry representatives often indicate that milks packed in plastic containers exhibit a longer shelf-life than that packaged in paper; likewise they indicate that nonfat milk has a shorter shelf-life than other fluid products. Our data does not support either industry impression. The single samples of extra rich milk packed in plastic spoiled only two days after the pull date, but that is still well inside the overall population standard deviation. A much more meaningful measure to consumers is how many days the milks will keep after they are brought home from the store. Again, there are no differences either among products or between paper and plastic; the consumer can expect milk to keep an average of 11.4 days from the date of purchase or 5.4 days past the retail pull date. Many processors guarantee on the carton that their products will keep seven days past the retail pull date. Our data show that two-thirds of the time, products keep between 1.7 and 9.1 days past the pull date. The probability in 1984 was 17% that a given sample of fluid milk would last seven or more days past the retail pull date.

The standard plate counts for the milks (Table 6, 7 and 8) tell a similar story. Differences among products or between paper and plastic containers are negligible at the time of purchase (Table 6 and 7). Between 1974 and 1984, there appears to have been a slight improvement in bacterial quality of retail milks at the time of purchase; from 89.9% to 95.2% of samples examined had legal (<15,000 ct/ml in California) standard plate counts. This improvement might reflect the change in the size composition of the California dairy processing industry; smaller plants are being closed down and replaced with larger plants.

The mean riboflavin concentration for the 615 retail milk samples examined in 1981 and 1984 was 1.61 + .26 µg/ml. Several workers (3,5,7,12) have reported measurable differences between the riboflavin concentrations of retail milks packaged in paper and plastic containers. These studies were done under laboratory conditions that simulated conditions in the retail dairy case. Our samples were collected directly from the dairy case and therefore reflect riboflavin contents of milk that consumers purchase. Our data showed no statistically significant differences in riboflavin content either among products or between paper and plastic packages. Because loss of riboflavin from milk is said to be triggered by exposure to light, we analyzed each survey's data on the basis of whether the sample had the characteristic light-activated flavor.

TABLE 3. Flavor intensity by container type for the surveys.

Year	1974	1981[1]		1984		All Surveys	
Package	Paper	Paper	Plastic	Paper	Plastic	Paper	Plastic
Score				Percent of Samples			
None	49	58	39	88	45	63	40
Questionable	6	4	4	1	16	4	10
Slight	29	26	27	10	19	21	25
Definite	13	12	20	0	18	11	19
Pronounced	3	1	10	0	1	2	6
Definite and Pronounced	16	13	30	0	19	13	25

[1]Data from reference 10.

TABLE 4. Days after pull date to spoilage: 1984 California survey.

Package	Paper		Plastic	
	Days			
Product	Mean	Std. Dev.	Mean	Std. Dev.
Nonfat	6.1	3.9	5.8	3.0
Lowfat	5.2	3.9	5.7	4.4
Regular	5.8	5.2	5.2	3.1
Extra-Rich	5.4	4.2	2.0[a]	
All products	5.4	5.2	5.4	3.6
All products, all containers: 5.4 ± 3.7				

[a]Single sample.

TABLE 5. Days after purchase to spoilage for two surveys.

Year	1974	1984	
Area	South Bay	California	
Package	Paper	Paper	Plastic[1]
Product		Days	
Nonfat	11.2	11.6	12.4
Lowfat	13.7	11.4	12.0
Regular	14.0	11.7	10.9
Extra Rich	13.3	9.1	11.0
All products	13.1	11.0	11.4

[1]Insufficient number of samples in platic containers in South Bay for meaningful data analysis.

TABLE 6. Standard Plate Count (SPC) at the time of purchase. 1974 Survey.

Package	Paper[1]			
Product	Nonfat	Lowfat	Regular	Extra-Rich
SPC	Percent of Total			
<15,000	88.3	99.6	91.0	66.1
15,001-150,000	11.3	0.4	5.9	33.9
150,001-1,500,000	0.4	0	3.1	0

[1]Number of samples in plastic containers insufficient for meaningful data analysis.

Samples that had detectable light-activated flavor did not have statistically significantly different riboflavin concentrations from samples that did not. A one-cup serving of the average retail milk would provide 21.8 ± 3.5% of the maximum recommended dietary allowance (4) of riboflavin, more than the average declared on package labels.

Because we wanted to ascertain whether the retinol concentrations of fluid milk products is affected by type of package and amount of light exposure the data were sorted by package type and by the absence or presence of light-activated flavor to show the mean retinol concentrations found in various products. The most obvious difference in Table 9 is that only one sample, an extra rich milk packaged in paper, was criticized for light-activated flavor in 1984. Samples of nonfat, lowfat, and whole milks that were packaged in plastic and criticized for light-activated flavor had nearly the same concentration of retinol as their counterparts that were not criticized for light-activated flavor. Among samples that were not criticized for light activated flavor, differences in retinol concentration between samples packaged in plastic and those packaged in paper approach statistical significance only for nonfat milk. It appears from these data that the most important choice consumers can make with regard to retinol concentrations of milks at the time of purchase is the type of product they buy. At the time of purchase, lowfat milk has, on the average, about twice the retinol concentration that nonfat and whole milks have. One cup of retail milk provides anywhere from 10-20% of the recommended dietary allowance (4) for retinol, depending on the product.

CONCLUSION

Retail milk should be a wholesome, good-tasting product. Surveys in California during the past decade indicate that most California retail milks are. Some factors that affect quality (for instance, how milk is handled after it is delivered to the retail outlet) are beyond the control of the processor. For problems at retail, an aggressive educational program for all milk handlers with regular and thorough follow-ups will help reduce mishandling of milk. In the absence of any further governmental regulation, it becomes the responsibility of the industry to provide and support this kind of program. The dairy industry also must continue its efforts to educate the consumer about the importance of handling dairy products properly.

ACKNOWLEDGMENTS

The authors are indebted to the personnel of the Santa Clara County Health Department who assisted with sample collection and evaluation for the 1974 survey; and to Lynne De Couto, Chris Yeager, Nicole Rutherford, Claudia Carhart, Kai Kuan, and Catalina Yee for their technical assistance.

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TABLE 7. Standard Plate Counts (SPC) at time of purchase. 1984 survey.

Package	Paper				Plastic			
Product	Nonfat	Lowfat	Regular	X-Rich	Nonfat	Lowfat	Regular	X-Rich
SPC	Percent of Total							
<15,000	98.5	96.7	94.5	88.7	100.0	97.9	93.2	100.0
15,001-150,000	0	0	3.3	8.5	0	2.1	1.9	0
150,001-1,500,000	1.5	1.6	0	0	0	0	0	0
>1,500,000	0	1.6	2.2	2.8	0	0	4.9	0

TABLE 8. Standard Plate Counts (SPC) at pull date. 1984 survey.

Package	Paper				Plastic			
Product	Nonfat	Lowfat	Regular	X-Rich	Nonfat	Lowfat	Regular	X-Rich
SPC	Percent of Total							
<15,000	19.1	5.8	19.1	12.3	0	13.8	12.3	0
15,001-150,000	77.1	85.4	71.5	87.7	100.0	79.3	85.2	100.0
150,001-1,500,000	3.8	0	4.7	0	0	0	0	0
>1,500,000	0	8.7	4.7	0	0	6.9	2.5	0

TABLE 9. Concentration of retinol in California retail milks in 1984.

Flavor	Light				Nolight					
Package	Paper		Plastic		Paper		Plastic		Overall	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Product	µg/100mL									
Nonfat	----	----	34.1	----	49.7	36.5	24.5	15.7	46.7	35.3
Lowfat	----	----	77.5	32.0	82.3	32.2	82.9	72.7	81.3	30.1
Regular	----	----	41.4	13.3	45.8	17.3	38.5	11.0	42.9	15.2
Extra-Rich	98.9	----	----	----	68.0	42.1	----	----	69.5	41.6

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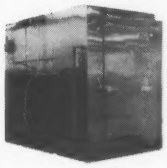

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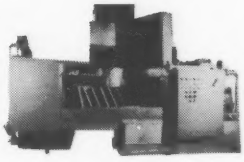

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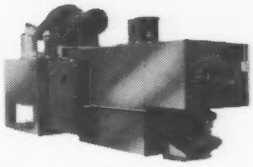

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Managing a Sanitary and Safe Foodservice Operation

(Reprinted from Restaurants USA, Vol. 7 No. 10, November '87)

The overall goal of a sanitation program is to control the handling of food from purchase to service to ensure its safety. The manager has a number of factors within his or her control that can ensure a sanitary operation and safe food. These control points include:

•**Hiring foodhandlers**. Job applicants must be observed for the physical signs of health problems and for poor hygiene habits.

•**Purchasing and maintaining equipment**. Equipment and facilities must be designed and maintained with sanitation in mind.

•**Purchasing food**. Food must be purchased from safe sources and checked immediately upon receipt.

•**Storing food**. Food to be stored for any period of time must be kept at the proper temperature and humidity. The first in, first out rule must be observed.

•**Preparing food**. Food should be prepared as close to serving time as possible. The cardinal rules of time and temperature must be observed.

•**Serving food**. Proper handling of utensils and food items is required during service. Foods for self-service must be displayed so that contamination by patrons is avoided.

The foodservice manager has control over each of these factors. How much control is exercised depends on the skills and attitudes of the manager. The manager who knows what the sanitation hazards are, develops a sanitation program to prevent contamination, and hires and trains workers is three-fourths of the way to ensuring safe food. The final factor in any sanitation program is evaluating the results.

Evaluating results is a part of any management operation. So it is with sanitation. Few people know the facility and the employees as well as the foodservice manager. Even the health inspector will not know every potential hazard in the operation as well as management. Evaluating the sanitation program, including procedures and employee progress, is a vital part of keeping food safe.

There are many ways to gather information on the success of sanitation efforts. You can watch the sanitation activities in progress as your employees carry them out. You can ask them about their jobs. You can survey the physical results of their efforts. Or you can go to your most important source of information - and your most difficult critics - your guests.

•**Supervision and employee feedback**. The manager's responsibility for safe foodservice doesn't end when a trained employee is assigned to do a job. A manager must continue to make certain, through regular, on-the-spot observation, that tasks are being properly performed.

Employees should not be made to feel that they are being graded or spied upon, but that their work is important. It should be made clear to them that the boss is interested in what they do and how they do it and is receptive to new and better ideas. If problems are discovered, the employee should be shown how to correct them. Discipline alone is not going to change workers actions.

Supervision is made much easier if employees are motivated to do a good job. Much of this motivation should be accomplished during training, but the way employees are treated on the job will also have a telling effect on their morale. Treat your employees as fully contributing members of the foodservice team, and the chances are good that their actions will fall in line.

Employees can be valuable sources of information when it comes to sanitation. They may observe things during their jobs that do not seem quite right yet they may not tell the management for one reason or another. Managers should encourage constructive feedback from employees who perform sanitation-related tasks or are directly involved in the preparation and service of food.

The best way to get information from employees is during employee meetings. Encourage employees to let you know if they have noticed problems, as with equipment or pests, or if they have ideas for improving sanitation. Their comments could be enlightening. For example, you may discover that the reason the sanitizing solution is not working is because it is not dispensing properly into the machine, or you may discover that no one is around to check poultry deliveries when they arrive.

•**Self-inspection**. Another way in which you will be able to tell whether sanitation efforts have borne fruit is

whether you can pass your local health department's inspection. But you cannot rely on these infrequent visits to monitor the day-to-day success of your attempts to prevent contamination. You must develop a system for continually and systematically checking on all phases of your operation to assure yourself that unsafe conditions do not arise, despite all your efforts. The best way is through regular self-examination.

Self-inspection must be thorough to be valuable. A quick run through the facility is not sufficient. Self-inspection should be a regularly recurring task performed by trained personnel who are familiar with the establishment's overall operation.

•What should be inspected?
A self-inspection program should cover the following areas:

•Personal hygiene of foodhandlers and servers
•Foodhandling practices
•Receiving areas
•Food storage areas
•Food preparation areas and equipment
•Food-holding equipment
•Food transportation equipment
•Warewashing and storage areas
•Lobby, dining rooms and serving areas
•Customer restrooms
•Employee facilities
•Storage areas
•Inside and outside garbage and trash storage and disposal areas
•Boiler rooms and mechanical operating equipment; utilities installation.

•When should self-inspection occur?
Self-inspection that is a regular part of a management routine is the most valuable. The manager should categorize the areas and sanitation practices into an inspection schedule that is flexible. Self-inspection should be conducted as often as necessary to identify and solve sanitation problems. If certain areas are constantly found to violate sanitation standards, they should be inspected more often until corrective measures have ended the problem.

The food preparation procedures should be observed as often as possible during busy periods because this is when sanitation problems are most likely to occur. Storage areas should be checked regularly to ensure that food is being held at proper temperatures. Employees should be observed every day for signs of illness or poor personal hygiene.

When conditions are found that do not measure up to sanitation expectations, steps should be taken to remedy the situation as soon as possible - immediately if the problem results in direct food contamination. These steps may be as simple as replacing worn scrub brushes or defrosting the refrigerator, or more complicated measures such as emergency training sessions may be required.

•Developing a sanitation checklist
So many small but important details should be reviewed in the process of your sanitation self-inspections that it would be easy to overlook some. The manager of even a small operation may find it desirable to make inspections on the basis of a checklist.

Checklists for facility-wide inspections can be obtained from a variety of sources, including national, state and local public health departments. To be most helpful, however, your checklist should cover your particular establishment in detail. It should be compatible with your local foodservice sanitation regulations. It should also be organized so that you can conduct either full-scale inspections or spot checks of problem areas.

The National Restaurant Association publishes a guide to developing your own sanitation checklist. This publication is called *Sanitation Self-Inspection Program for Food Service Operators* and is designed so that the checklists can be removed and copied for repeated use.

In the guidelines accompanying its checklist, the National Restaurant Association recommends that you keep your self-inspection sheets on file. Copies can then be furnished to local regulatory agencies as a token of your interest in sanitation. This cooperative action will encourage them to regard your establishment in a favorable light. Agency representatives may be able to identify your special problems on the basis of these inspection sheets and to assist you in finding solutions. The self-inspection records will also be useful as evidence of your active sanitation program in case you are confronted by representatives from the news media or consumer groups. They can be useful in the event of a legal problem.

The National Restaurant Association has published a 24-page book on self-inspection called *Make a S.A.F.E. Choice: Sanitary Assessment of Food Environment* this year. The book's five chapters include overviews of self-inspection systems, major foodborne diseases, potentially hazardous foods, applying the principles to your own process and planning for crisis management. This material is also covered in a seminar by the same name.

Excepted from Applied Foodservice Sanitation, a certification course, 3rd edition, 1985. The course is offered by the Educational Foundation of the National Restaurant Association.

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Radiation in Drinking Water: Dealing with Uncertainty

Doug Ryan
Jefferson County Health Department
(Reprinted from the NEHA Newsletter/Winter 1988)

Every day we go out into the world in the face of risk and uncertainty. Most of us do not spend an inordinate amount of time or energy worrying about the risks we face. Instead, we make those adjustments that we judge to be prudent and face the challenges of each new day with enthusiasm.

In our society, we make personal choices about whether to wear seat belts, smoke cigarettes or keep loaded guns on the bedstand. The increases or decreases in risk resulting from these activities are well defined and understood by a large percentage of the population. The risk associated with radiation in drinking water falls into this category.

Some public and private drinking water supplies in Jefferson County are known to contain radiation in excess of the standards for community supplies. As environmental health professionals, one of the most challenging tasks we face is that of accurately addressing the public concerns on this issue. The information in this article was compiled in an effort to better educate water purveyors and the public on radiation terminology and the public health significance of radiation in drinking water.

Radioactivity is a physical process by which some unstable elements lose energy by emitting radiation. This energy may be released in three forms: alpha particles, beta particles, and gamma rays. Alpha particles consist of two protons and two neutrons. Alpha particles are the heaviest form of nuclear radiation at about 2,000 times the mass of an electron. Beta particles are high energy electrons ejected from the nucleus of an atom. Gamma rays are a form of electro-magnetic radiation similar to an x-ray.

Three units are commonly used to describe radioactivity. The curie is a measure of the activity in terms of numbers of particles emitted per second. Normally, radiation levels in drinking water are expressed as pico curies per liter (pCi/l). Each type of particle has different physical properties so a unit that describes the dose that is received by the body is needed. That unit is the rad. As might be expected, a dose of one rad of alpha radiation would produce a different effect than one rad of beta or gamma radiation. The rem compensates for these differences. A rem adjusts for the different types of radiation so that their effects on the body are comparable.

Radioactive materials are either naturally occurring or manmade. There are three naturally occurring radioactive series: thorium, actinium and uranium. Each series involves a sequence of alpha, beta and gamma decays and each ends with a different stable isotope of lead. Radon gas is formed in each natural series. In nature, these isotopes may decay from rocks and migrate to adjacent water aquifers. Cosmic rays (high energy protons from outside the earth) are another source of natural radiation.

Manmade radiation includes fallout from bomb testing as well as more common forms such as diagnostic x-ray and color TV's. Manmade sources of radiation are not normally associated with groundwater supplies. The average dose to people in the U.S. from cosmic rays and natural background radiation is 100 millirem per year (mrem/year). Manmade radiation adds another 100 mrem/year, mostly from diagnostic x-rays.

The health significance of radiation is associated with biological damage to the body's cells. These effects can occur as somatic damage, which occurs to the exposed individual within his lifespan, or as genetic damage, which effects future generations. Cancer is an example of somatic damage.

For high doses above 100 rem, effects in humans can usually be observed. Low doses, such as those associated with background radiation, show no well demonstrated effects. This is partly because at low levels the probability of having an effect is on the order of one in a million. In order for studies on health effects to be statistically valid, hundreds of millions of people would have to be exposed for long periods of time. Another conflicting factor is that many of the symptoms associated with radiation exposure can also occur spontaneously, or from causes other than radioactivity.

While the effects of low doses of radiation are not accurately known, it is possible to extrapolate from high

dose effects. Figure 1 shows an example of this extrapolation. The solid line represents the relationships between dose and effects that are known. The dashed line is the extrapolation. As can be seen from the line, the assumption is that effects are linear and that even the smallest dose will have some effect if enough people are exposed.

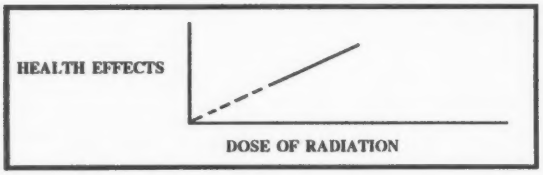

Figure 1.
Possible dose-effect relationship for low level exposures. The dashed line represents those doses where the effects are not known.

Figure 2 lists the standrds for naturally occurring radiation in public community water supplies in Colorado. The levels are set in terms of pico curies per liter.

Combined radium - 226 and radium - 228
5 pCi/l
Gross alpha activity exclusive of radon and uranium
15 pCi/l
Radon and uranium - no standars set at this time.

Figure 2
Maximum contaminant levels for natural radioactivity in community water supplies.

Figure 2 lists the standards for naturally occurring radiation in public community water supplies in Colorado. The levels are set in terms of pico curies per liter.

The real question for public health specialists is what risk do these radioactivity levels pose and how acceptable are those risks? The gross alpha activity is not directly applicable to risk analysis and is most useful as an indicator to warrant further tests. This is because the source of the alpha particle determines to a large degree how it will react with the body and what health effects may occur. It has been calculated that ingesting water with a radium concentration of 5pCi/l produces a dose to the bone and bone marrow of 92 mrem/year at the 70th year for an estimated risk of about 44 premature cancer deaths/lifetime/million people exposed. While no standard has been set for uranium, a concentration has been suggested for this standard at 10pCi/l. This level would produce a 100 mrem/year dose to the bone and bone marrow at the 70th year for an estimated 34 premature cancer deaths/lifetime/million people exposed. These estimates are cited in the reference by Cothern et al. noted below. In the case of radon, exposure to critical organs is primarily through inhalation. A certain percentage of radon in water enters the air from showers, washing clothes and dishes, etc. Acceptable levels for radon will probably be set much higher than for uranium, although no proposed standards have been published.

Cancer is one of the most feared diseases of our time. Is a risk on the order of 40 additional cancers per million population acceptable? What context can we use to make that judgement? One way is to compare the risks with other risks we face. The risk of death resulting in a motor vehicle is 15 per lifetime per thousand people. Smokers may increase their risk of cancer deaths by 17 per lifetime per hundred smokers. On the other hand, the risk of death from animal and insect bites, or lightning strikes is about the same as for lifelong consumption of drinking water at the maximum contaminant level for radium.

From this perspective, the risks of radiation in drinking water at or below maximum contaminant levels is low. It is apparent that in many instances the public does not share this perspective, however. **Research has shown that people are willing to accept voluntary risks about 1,000 times greater than they will accept involuntary risks.** In any regard, the fact that risks associated with radiation in drinking water are low compared to other risks we face should not deter us from trying to minimize the exposure to a level which is as low as possible considering cost and feasibility.

We must be willing to accept some risk in our society. By educating the public about the degree of risk they face, we will be better able to aid in the task of setting priorities to improve the quality of our lives.

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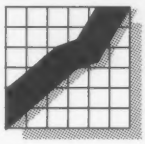

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Turn on the Heat to Control Insects

Jerry W. Heaps, R.P.E.
Registered Professional Entomologist and Certified Sanitarian
Corporate Environmental Health Auditor, Nabisco Brands, Inc.

Superheating (often referred to a heat sterilization) is not a new technique to control stored food product insects. In the early 1900's , heat was used as a technique to kill cereal infesting insects. However, the procedure was abandoned because of the damage it caused to wooden floors and equipment; belts melted and grease would liquify and run out of unsealed bearings. Now, we have come full circle and can utilize heat as a pest elimination tool. Concrete has replaced many wood floors, metal has replaced wooden machines and new machine bearing technology has eliminated many of the previous problems encountered during a heat-up (Imholte, 1984). Plus, we have lost the use of spot fumigants such as ethylene dibromide (EDB).

Simply stated, superheating is a process by which an area or material is heated to a temperature of between 130° to 140°F and maintained for a time period long enough to ensure adequate penetration of heat has occurred into the desired location (Cooney, 1985). This may only be a few hours for a room or pieces of machinery being heated or as long as twenty to thirty hours for a building heat-up. Its purpose is to kill any life stage (egg, larvae, pupa, adult) of stored product insects. The insects are killed by dehydration, key enzyme destruction or protein coagulation in their bodies. Cockroaches can be killed by superheating temperatures if contained in the area. They are much more mobile than flour beetles and quickly sense the increased heat and want to escape it if possible. This may make control less than desirable. It must be emphasized that heat cannot be solely used for pest control. It is but only on integral part of a plant/area wide integrated pest elimination system that would also include, but not limited to, raw material inspection, machine cleaning, general sanitation procedures, commodity fumigation with methyl bromide or metal phosphides per label requirements, timely application of insecticides as labeled, finished product inspection, warehouse, food storage and distribution inspections by qualified personnel.

Annual Schedule Frequency

In a temperate climate, six to seven superheatings could occur annually. More frequently (every six to seven weeks) in the warmer months when insect activity and reproductive rates are high, and perhaps every 10 to 12 weeks during winter. This spacing will provide a disruption of the life cycle of cereal infesting insects plus is based on their seasonal activity periods. Plants located in warmer parts of the country should consider more frequent superheatings a year due to the lack of a cold winter season.

When scheduling a heating, serious and careful considerations must be given to production schedules so that proper planning occurs and downtime is minimal.

Areas You Heat and Don't Heat

Several criteria are used to determine where to use heat for insect control. First, production, packaging and processing areas should be identified as most likely to be infested. Secondly, the area must be sealable so target temperatures can be maintained. You also need to designate an area to store items that may be damaged by heat. Consideration is also given to the number of cubic feet you must heat effectively and economically plus the logistic ability to fit enough heaters into the area.

Setting A Time to Heat-Up

During the course of a year, heat-ups can be scheduled during a Saturday-Sunday weekend, over a long holiday weekend or during a general plant shutdown. Remember, even though most of the plant is undergoing a heat treatment, there are still areas left unheated and work can be done there.

When scheduling a heat-up over a two-day weekend it is crucial that the heat be turned on as soon as possible. Each hour delay means fewer hours to cool-off the area and prepare for production start-up. Ideally, at least twelve hours may be needed to prepare the building and machinery for a heat-up. Heat the areas to the required temperatures as quickly as possible (2 to 4 hours) but slowly enough to prevent thermal shock. Ground floors may require longer to heat-up because of low soil temperature. Portable air circulation fans may keep hot air circulating.

Manpower

Don't get caught short of help. Have an ample labor force available to accomplish all the necessary machine cleaning and preparatory work. It may be advantageous to initially have one or two extra people available to take care of those "last minute problems and details". Once the areas being heated are up to temperature, it then becomes a case of monitoring them and checking machinery for problems. Employ a buddy system where two people are always going out into the heated area. Have a common meeting room in a non-heated area where equipment is kept and people stay when not monitoring the heat-up. Employee comfort and safety is of primary importance. Employees working in the heat should be medically screened and counseled prior to work to be sure they are fit to do so and understand the technique. Make sure phone lines are available for calls, emergency numbers are known and family members know where to call in case of an emergency.

Building Modifications

Wooden floors may not go through a heat-up. It is a known fact that the heat dries wood, causing cracking. Where possible, any wood should be replaced with a building material not harmed by prolonged exposure to 130°-140°F. However, if wooden floors cannot be replaced, the area still can be successfully heated if relative humidity is high. Self-experimentation and caution is advised and begin with a small area initially until the technique is mastered.

Sprinkler heads need to be changed to the high temperature (250° to 265°F) tolerance variety in heated areas. Even a 160°F head can go off at temperatures less than 160°F, because "hot spots" do occur during a heat-up causing the weakening of the bi-metal fuse in the sprinkler head. A weakened head releases water as hot water expands. Sprinkler head water lines may need "bled" of pressure before a heat-up to allow for water expansion to occur as it's heated.

Areas being heated need to be sealed from non-heated areas. Sealing could be permanent, with concrete or caulk, or temporary using one inch styrofoam. Success has been achieved by using tarpaulin material to seal off areas.

Holes where pipes go through walls need sealing. Caulking should be done around electrical boxes, conduit, wall and floor or wall and ceiling junctions, and other similar situations. Elevator shafts, roof vents and ducts, stairwells, locker rooms, may need sealing to prevent heat loss.

Initially, any "sealable" space within a heated area could be left open to allow heat penetration to kill or drive out insects. This would give a "cleaning out" effect. After several heat-ups, these areas could then be sealed.

The disadvantage is that insects could escape to an area not heated and survive. Approved and labeled insecticides can be applied to these identified escape areas (outside of a heated area) to limit insect survivability. Applying insecticides in the superheated area will have limited success as it may breakdown after prolonged exposure to the heat. Check with the manufacturer and technical representatives first.

Heaters

Heaters can be of several types as long as efficiency and economics are not compromised. The heaters have fans and can be fueled with steam, gas and oil. The heaters can be permanently installed in the ceiling or placed on portable carts. The BTU range also varies depending on heater size.

The number of heaters per floor and their location is dependent upon the energy (BTU's) needed to heat the area to the target temperatures and ease at which they can fit the current building and equipment design pattern. Energy calculations, heat loss, and other similar pertinent information must be done by engineers before any step of a superheating can continue.

In small rooms, heaters are normally placed in a corner. Larger rooms and areas have heaters in the middle also. The important factor is to keep hot air moving in a clockwise or counter-clockwise fashion around the outside walls so every part of the area is heated.

Heaters can also have spring operated, automatic self-regulating temperature values set to close at approximately 140°F or thermostatically controlled solenoid valves that will keep, for instance, steam coming into the heater until target temperatures are reached. The spring operated valves have a tendency to "close" too soon, causing a loss of heat output from the heater. Heater motors must also be of a special type to withstand the rigors of heat.

Vortex cooling units, or other similar types can be installed in electrical control panels to keep them cool during a heat-up. Sensitive electrical and computer components should be insulated from or removed from the heat. A signed check off list is useful for these and any job needing to be done before a heat-up to be sure items are completed.

Preparatory Items

One cannot emphasize how important an excellent machine cleaning and general clean-up is for an effective superheating. Beyond the importance of cleaning, your goal is to eliminate product and waste build up that insects can use as a harborage or for insulation from the heat. Waste receptacles need to be dumped and cleaned, floor cabinets, dust collectors, and air pick-up pipes need attention. After cleaning, it is helpful to leave equipment open (when practical) so heat can better penetrate them and reach void areas.

A thorough inspection of the area undergoing a heat-up needs to be done before the process is started to ensure

that any suspect materials that could be heat damaged are removed. When in doubt, check with the manufacturer or supplier for pertinent technical data on heat sensitivity. In my experience, the following items should be removed: fire extinguishers (place in nearby, accessible, cool area), fork trucks, aerosol cans, paper packaging materials as heat causes warping, welding or construction materials that may be flammable (check contractors gang boxes), tanks of oxygen or other similar materials, vitamins, flavoring and flammable liquids. The list certainly is not all inclusive and each facility must take into account its own operation and experimentation of what may or may not be heat damaged.

Machine belting may need loosening to allow expansion and vulcanized belting withstands heat better than glued belting which can separate under intense heat.

Mechanics should inspect machinery after a heat-up for mechanical problems. This could also be used as a time to do preventive maintenance on machinery that was running non-stop for production purposes before the heat up.

Test vials or cages of insects need to be strategically placed in heated areas to determine percent kill at the end of the project. Have a check off list available and make sure at the conclusion of the heating process you collect as many vials as you initially put out. Try to place the insects in areas where you feel the heat may not penetrate versus wide open areas. Mortality occurs rather easily in open areas. You want to check heat penetration into more secluded spots. Keep a record of the areas you find dead insects in during your plant inspection after the heat-up. This can be used as a clue to potential infestation problems if you consistently find dead insects in the same location. Again, exposed insects are killed at 131°F in 5 to 10 minutes. One hour at 120°F kills all life stages. The key is reaching the target temperatures for a long enough period of time, allowing all areas to reach lethal temperature (machinery interior, voids, dust collectors and piping). Thermometers of various types (digital or manual) can be used to monitor temperatures in heated areas or more sophisticated computer sensors can be installed.

Cool Down

Buildings normally cool down slower in warm weather versus cold and dependent on building materials, construction and ventilation ability, too. Ample time needs to be set aside to allow this cooling down process to occur effectively and employees have a comfortable work environment to return to.

It is also suggested that the first finished product off the line is scrapped, since it may contain dead insects that entered the system during the process of superheating.

In summary, superheating (heat sterilizing) an area where applicable, insect elimination is effective, economical, safe and insects have not become resistent to it as they have with insecticides. Heat is also a technique that is much easier to "sell" to personnel and groups that have become "chemophobic" and resistant to using pesticides.

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A Summertime Hot Line For Food Safety Questions

Chris W. Lecos
Member of FDA's Public Affairs Staff
(Reprinted from FDA Consumer/June 1988)

From June through August, the residents of Florida, Illinois and Massachusetts will be able to dial a toll-free number to get quick, expert advice and answers to most of their questions about food safety.

The program is a pilot for the Food Safety Hotline, being jointly sponsored by the Food Safety and Inspection Service of the U.S. Department of Agriculture and the Food and Drug Administration. Consumers in the three states can dial 1-800-426-3758 between 10 a.m. and 4 p.m. Eastern time Monday through Friday. The phones will be staffed with home economists trained in food safety issues that fall under FDA and USDA jurisdiction.

By law, the Agriculture Department has jurisdiction over meat and poultry products, and FDA regulates all other foods. However, with the joint hot line, consumers won't have to concern themselves with which agency to call.

FDA Commissioner Frank E. Young, M.D., Ph.D., said that he believed the service could make an important contribution toward improving the public's knowledge and awareness of food safety. In a letter last December to Lester M. Crawford, D.V.M., Ph.D., administrator of USDA's Food Safety and Inspection Service, Young noted:

"A cooperative project between our two agencies to pilot test the concept of a Food Safety Hotline will be a notable step forward in providing consumers with a national focal point for obtaining timely and accurate information.

"All too often," he continued, "consumers do not make jurisdictional distinctions in seeking needed information about microbiological contamination, foodborne illnesses, and other food safety issues. This pilot effort will help us to make essential information about food safety more readily accessible to consumers while, at the same time, providing us with valuable data for our respective consumer education programs."

Both agencies said that they would carefully evaluate the pilot effort to see if the program should be expanded and made permanent. Individuals who call after the service is discontinued will hear a typed message asking them to contact USDA's Meat and Poultry Hotline, a toll-free service operated by the agency since 1985.

Typical of the kinds of calls to be handled by the Food Safety Hotline will be:

·**Microbiological hazards in food** - Organisms that cause food poisoning occur naturally and can be brought into the home. For example, *Salmonella* has been a problem with poultry and meat products. *Listeria monocytogenes* has been associated with a number of food poisoning outbreaks involving cheese products in recent years. Other common concerns include potential health problems associated with some shellfish and other seafood.

·**Food additives** - In recent years, FDA has received numerous inquiries about the safety of artificial sweeteners such as aspartame and saccharin, sulfites and other preservatives, color additives, and other substances added during food processing.

·**Food packaging and processing** - Consumers have expressed concern about possible health hazards of chemicals from food packages leaching into the food. Processing techniques for canning and freezing foods, as well as proper ways for handling foods for cooking in microwave ovens, also prompt numerous inquiries. FDA also receives many inquiries on irradiating food products, a preservation method now approved for use on pork, fresh fruits and vegetables, and spices and herbs and other aromatic seasonings.

·**Contaminants in food** - In recent years there has been considerable public interest in chemical contaminants such as urethane in alcoholic beverages, pesticide residues in foods, and others, some of which occur naturally (aflatoxins and urethane, for example).

Other common subjects of interest include fruits and vegetables; imported foods; lead and the safety of earthenware and cookware, the regulation of filth and decomposition in foods; nutrition labeling; food animals, including animal drugs, drug residues, and medicated feeds; and pet foods, including their safety and labeling requirements.

Although the Food Safety Hotline staff has received extensive train-

ing and is expected to handle most of the calls on the spot, some calls may require additional research or may have to be referred. Calls to be referred include reports of injury or illness, food poisoning reports, fraud-related questions, and diet and health queries.

Both FDA and USDA receive thousands of consumer inquiries each year. During fiscal year 1987, which ended last Sept. 30, FDA responded to more than 56,000 inquiries on foods, drugs, cosmetics, medical devices, radiological products, veterinary products, and other matters under its jurisdiction.

USDA also responds to the thousands of inquiries each year, many of them through the agency's Meat and Poultry Hotline (1-800-535-4555). During its more than two years of operations, the Meat and Poultry Hotline has served more than 105,000 persons.

Typical calls received by USDA concerned safe ways to prepare, store, refrigerate, freeze and thaw foods; how long to cook meat and poultry; how to tell if foods have spoiled; and how to safely pack foods for lunch, picnics and other outings.

FDA surveys in recent years indicate that many Americans are concerned about the chemical additives and pesticide residues in foods, even though U.S. safety standards and safety margins are the highest in the world. Of greater concern to scientists at FDA and elsewhere is the need to inform Americans of the potential health hazards from microbiological contamination of food - particularly in the home. Public health officials note that mishandling of food in home, including failure to follow appropriate sanitation and food handling procedures, accounts for most food-borne illnesses in the United States. Many of these are preventable, and both FDA and USDA hope that education through such vehicles as the Food Safety Hotline will lower their incidence.

FDA regards microbiological hazards and food-borne illnesses as a major public health problem, one that is often underestimated and misunderstood by the general public. The economic cost alone, it has been estimated, runs into billions of dollars in medical care and lost wages each year. FDA is devoting an increasing amount of its resources of food-borne microbiological hazards.

The potential seriousness of food-borne disease is best illustrated by some recent studies, including one published in 1985 by two FDA scientists, Douglas Archer and John Kvenberg. They estimated that 21 million to 81 million cases of diarrhea occur in the United States each year as a result of food-borne pathogens. (Diarrhea is a major symptom of food poisoning.) Many experts believe that food poisoning incidents could be reduced substantially if better food sanitation and hygiene were practiced in the home and at restaurants and other eating establishments.

Although the types of pathogens that can cause outbreaks of food poisoning number in the hundreds, public health scientists are concentrating on the several dozen that are responsible for most food-borne outbreaks and also with finding ways to readily detect these organisms in the laboratory.

For example, the largest outbreak of *Salmonella* food poisoning in U.S. history occurred in 1985. Public health officials confirmed that 16,284 persons in six states become ill after drinking contaminated low-fat milk produced at a suburban Chicago dairy. It was later estimated that as many as 200,000 persons have been become ill and two to 12 people may have died. When a food-borne outbreak occurs, it is not uncommon that many illnesses are never reported to public health authorities.

FDA also has been involved in recent years in several dozen recalls of dairy products, especially cheese products, that are found to be contaminated with *Listeria monocytogenes*. Once considered rare, *Listeria* infections are being reported with increasing frequency in the United States. Pregnant women, cancer patients, alcoholics, and people receiving immunosuppressive drugs are particularly prone to this type of infection. Healthy individuals who are exposed generally do not develop serious infections.

Consumers lack control over outbreaks traced to food production, but they can minimize the risk of food-borne disease in the home, and the Food Safety Hotline staff - trained to provide expert guidance on proper food sanitation and preparation - can help.

News and Events

Learn To Think Like a Rat For Effective Rodent Control

Spring is a good time for homeowners and urban dwellers to start thinking like rats, advises the National Pest Control Association.

With plant juices starting to flow and people moving around more outside, opportunities increase for spotting rodents around houses and apartments. People cleaning garages and shelters may disturb winter harborage areas for rats and mice. Then, too, rodents start venturing out on their own to chew on newly growing plants and shrubs.

"Most people consider rodent control as a fall operation, but it's equally important in the spring," says rodent researcher Dale Kaukeinen. "Rodents breed in springtime and it takes only three weeks for a young mouse to start creating as much damage as his parents. As populations expand, the new generation will be scurrying about trying to find new harborage areas.

More than just cleaning up garbage and edible debris, sanitation involves clearing away clutter. The average pile of firewood is an excellent harborage area for rodents, especially when the wood is left undisturbed for months. Stacks of cardboard boxes in the attic, piles of lumber in the basement, or general clutter in the garage all provide hiding places for rodents.

The first step in rodent-proofing involves keeping the foundation in good repair. Since a mouse can enter a building through a quarter-inch hole, it's important to seal breaks around pipes or wires, and fix damaged screens or doors. Creating a weed-free barrier, such as crushed stone, around the structure also helps prevent rodents from gaining entry.

If homeowners still see rodents or droppings after sanitation and proofing have been accomplished, it's time to consider control. An urban environmental pest control operator (PCO) understands rodent populations better than the average homeowner. He can survey the structure and determine where rodents gained entry, what they're eating, and where they're living.

"A single rat or mouse can do an enormous amount of damage," said Kaukeinen, a senior biologist with a world-wide rodent control product manufacturer. "It can chew wiring, get into insulation or make nests in furniture. If there's any concern about rodent disease or damage, it's best to call in a professional. Usually the cost of repairing or replacing damaged articles exceeds the cost of a PCO inspection and treatment."

After the PCO makes his inspection and treatment, he generally makes recommendations about what the homeowner could do to prevent the problem recurring the following spring. A professional who "thinks like a rat" can provide a valuable service to the average homeowners.

The National Pest Control Association is a world-wide organization representing specialists in the field of urban environmental structural pest control. Companies represented are involved in the prevention and control of destructive and disease-transmitting insects, rodents and other pests in homes, factories, food establishments, ships and other properties. NPCA was formed in 1933 as a non-profit trade association in support of the industry and public interest. Today, NPCA is comprised of 2,500 member companies in the U.S. and nearly 145 members in 43 foreign countries.

For additional information contact Joel M. Paul, NPCA, 8100 Oak St., Dunn Loring, VA 22027, 703-573-8330.

New Processed Citrus Advertising Director

Eugene L. "Gene" Richmond has been named as Director of Advertising/Promotion for processed citrus at the Florida Department of Citrus.

Richmond, 53, has been employed by American Motors Corporation since 1971. He held several different positions with AMC with the last as New Product Marketing Task Force Manager. Prior to his employment with AMC, Richmond worked from 1962 to 1971 with Schlitz Brewing Co.

In his new position, he will oversee the multi-million dollar budget for Florida orange and grapefruit juice advertising and promotion.

A native of Massachusetts, Richmond received his undergraduate degree in chemistry from Dartmouth College in 1958 and his master's degree in economics from Washington State University in 1962. He also has completed most of his doctorate degree in econometrics and attended the Harvard University Business School's Marketing Management Program.

For more information, contact: Cathy Clay, Information Specialist, Florida Citrus Commission, 1115 E. Memorial Blvd, PO Box 148, Lakeland, FL 33802-0148.

New Catalog Features Extensive Line of Products

Hach's *Products For Analysis* contains 192 pages of the products most needed by analysts monitoring water, wastewater, industrial process water, beverages, and food samples. Many new products are featured, including: low-level manganese and electroless copper test kits; a rapid coliform test; a fat analysis system for meat and dairy products; systems using Hach One electrode technology for pH and ion-selective electrode measurement; and the DR/2000 Spectrophotometer and DREL/2000 portable laboratory.

Other Hach products covered include the Digesdahl™ Digestion System; colorimeters and spectrophotometers; turbidimeters; over 200 test kits; BOD and COD systems; labware; fine chemicals, reagents, and standards; and Carle gas chromatographs.

To receive a free copy of *Products for Analysis*, write to Hach Company, PO Box 389, Loveland, CO 80539 and request literature number 3117.

Virginia Dairy Quality Control Conference

The Second Annual Virginia Dairy Quality Control Conference will be held September 21-22, 1988 at the Sheraton Red Lion Inn, Blacksburg, Virginia. This Conference is being sponsored by the Virginia Dairy Products Association. The program will focus on improved dairy product quality as influenced by: current and future research; dairy technology and processing; industry, regulatory, and academic cooperation; and overall awareness. Scheduled participants include: Dr. Charles White, Mississippi State University, Dr. David Bandler, Cornell University; Mr. Bob Garfield, Milk Industry Foundation; Mr. John Nichols, USFDA; along with Virginia Tech University Faculty. For more information, please contact: J. Russell Bishop, Food Science and Technology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, (703) 961-4921.

DFISA Foundation Creates Expo Scholarship

The Board of Directors of the DFISA Foundation has announced the establishment of an annual scholarship in exposition management in memory of Keith E. Stolldorf.

The scholarship is the first of its kind in exposition management will be presented in cooperation with Georgia State University. Each year a deserving college sophomore or junior studying exposition management as a career will be awarded the Stolldorf Scholarship.

Keith E. Stolldorf was senior vice president for Dairy and Food Industries Supply Association, Inc. (DFISA). During his twenty-year affiliation with the association, he was best known for his accomplishments in managing the biennial Food & Dairy EXPO, the largest exposition of its kind in the world.

Georgia State University has the only known course in the exposition management field; it is sponsored by the National Association of Expositions Managers (NAEM) and the International Association of Fairs and Expositions (IAFE). The first Stolldorf Scholarship was awarded to Deanna L. Young, on Thursday, May 26, 1988.

The DFISA Foundation was established by Dairy & Food Industries Supply Association in 1983 to award scholarships, fund industry educational activities, and assist in the development of industry wide research.

The DFISA Foundation sponsors the Collegiate Dairy Products Evaluation Contest, the Paul Girton & Gordan Houran Food Engineering Scholarships, and the DFISA/ASAE Food Engineering Award.

For further information about the DFISA Foundation contact the Foundation Secretary, 6245 Executive Blvd, Rockville, MD 20852-3938.

Louis C. (L.C.) Thomsen passes away March 21, 1988

The Department of Food Science at the University of Wisconsin has lost one of the leaders in the development and strengthening of the dairy industry in Wisconsin. On Monday, March 21, 1988 Emeritus Professor Louis (L.C.) Thomsen died at age 93. He was a native of Medford, Wisconsin where he graduated from high school and subsequently graduated from the University of Wisconsin with a BS degree in Dairy Husbandry. Later, he left a principalship in the Stetsonville school system to join the U.S. Expeditionary Forces in WWI. In 1919, following his military service, he joined the faculty of the Department of Dairy Husbandry (Food Science) at the University of Wisconsin. Professor Thomsen retired in 1965 after 46 years of teaching, research and extension activities.

Many of his former students vividly remember their advisor who was so dedicated to their success. He served as academic advisor to hundreds of undergraduate students. L.C. taught courses in buttermaking, applied dairy engineering and plant management. His teaching excellence was recognized in 1961 when the American Dairy Science Association bestowed on him their Master Teacher Award in Dairy Manufacturing. In 1962, he received the Outstanding Service Award from the Wisconsin Council of Agriculture. He directed the activities of the University Dairy Plant and was the major technical contributor to the construction of Babcock Hall in 1950.

One of his former students described him so well, "He was that kind of man, so well-known that his name came up in almost any dairy conversation for a great many years, and the hundreds of students that passed through class lectures and laboratory assignments were indelibly stamped by the soft spoken professor who taught and advised students without raising his voice, but often used a humorous illustration. He taught easily and well whether in the classroom or laboratory or out in the plant or conference room. He was just L.C."

Research contributions came from L.C. related to improved procedures for the manufacture of whey cream butter, the development of manufacturing conditions that improve the spreadability of butter and the processing of milk to produce a sterile concentrate. Much of this research information was transferred directly to contacts in the dairy industry through his role as an extension specialist. In 1964, the Wisconsin Creameries Association formerly recognized his many years of dedicated service to the dairy industry in Wisconsin.

In retirement he continued to serve the dairy industry as a consultant. He was active in the Wisconsin Historical Society and was involved in the development of Stonefield Village in Cassville, Wisconsin. L.C. was a dedicated, effective member of the University of Wisconsin faculty and all who knew him will long retain fond memories of this genuinely fine person.

For additional information please contact: R. L. Bradley, Univ. of Wisconsin-Madison, Dept. of Food Science, 1605 Linden Dr., Madison, WI 53706.

Dairy Task Force Looks at Industry Problems

The alarming decrease in the number of South Carolina dairy farmers has prompted the formation of a special task force committee that aims to find some solutions.

Fred Pardue, a Clemson University Extension Service dairy scientist who chairs the special committee, says the group will look into the problems of the state dairy industry and will propose possible solutions.

"We hope that something can be done in the future because if the decline in dairy farmers continues, the state will have to import milk from other states to meet our needs," he said.

There are currently about 250 dairy farmers in South Carolina compared to 340 ten years ago. Likewise, the number of dairy cows in the state has dropped to 8.9 percent since 1987 to about 41,000, Pardue said.

The price of milk offered to South Carolina dairy farmers is a problem that needs attention. "This is a complicated matter that must be studied and we must arrive at a solution," he said.

Instigated by the S.C. Dairy Association, the task force committee consists of 10 individuals who represent the public and private sectors of the state's dairy industry.

Clemson officials serving on the committee are: Jean Bertrand, professor of dairy science; Hal Harris, professor of agricultural economics and rural sociology; Charles Morr, professor of food science; Bill Stringer, professor of agronomy and soils; Curtis Weller, professor of agricultural engineering; and Terry Sudduth, a dairy Extension agent in Anderson.

Others serving on the committee include: Lawrence Ferguson, manager of Pet dairy in Spartanburg; Louis Harrison, a dairy farmer from Roebuck; Bill Ragsdale, a representative of the dairy supply and equipment company, M.G. Newell Co., Inc., in Honea Path; and Kelly Smith, secretary of the S.C. Dairy Association in Columbia.

The group met several times in May on the Clemson campus and will attend several public hearings this month with dairy farmers in Clinton and Santee.

Any questions please contact the S.C. Agric. Experiment Station, Clemsen Univ., Poole Agric. Center, Clemson, NC 29634-5609, 803-656-3208, Dr. Fred Padue.

New Critical Process Air Handling Guide Available

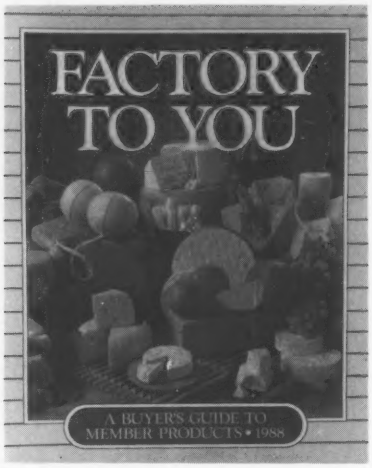
American companies invest tens of millions of dollars every year in quality control programs designed to assure clean, sanitary environments for food processing, electronic and pharmaceutical manufacturing, and health care. However, in many cases, the "ocean of air" which envelops the work space is overlooked.

King Company, the industry's leader in manufacturing air handling systems for critical process environments, has just released a new 12-page guide which discusses specialized air handling systems for such critical process environments.

Temperature and humidity control, pressurization, and alternative filtration systems designed for various bacteria, viruses and other airborne contaminants are all covered. The unforseen possibility for air handling units themselves to become biological contaminant breeding grounds is also discussed.

King Company is an industry leader in the design and manufacture of a complete line of refrigeration and HVAC equipment and components.

For a free copy of this System 2000 Guide which also includes complete technical specifications on King Company's new Series 2000 equipment which is engineered to produce these critical process environments, write or call the Engineered Air Systems Group at King Company, 1001 21st Ave. NW, Owatonna, MN 55060, FAX 507/451-3786, Phone (507)451-3770.



1988 "Factory to You" product buying guide available from United States Cheese Makers Association. For more information, contact: Jill Tillison, USCMA, 1-608-255-2027.

1988 "Factory To You" Now Available from the United States Cheese Makers Association

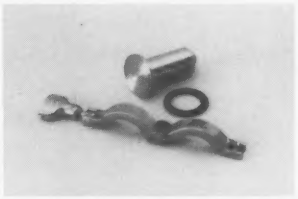
The 1988 edition of "Factory To You -- A Buyer's Guide to Member Products" is now available from the United States Cheese Makers Association (USCMA). This easy-to-use catalog contains information on the hundreds of cheese and butter product varieties manufactured by USCMA members.

Included in this year's larger-than-ever guide is an alphabetized index of members who manufacture each type of product, along with sales contact information for the buyer. Readers will also find product descriptions and helpful tips on cheese storage.

To obtain a copy of the 1988 "Factory To You" product buying guide, write to: United States Cheese Makers Association, PO Box 2133, Madison, WI 53701. Or call (608) 255-2027.

New Product News

The products included herein are not necessarily endorsed by Dairy and Food Sanitation.



Hitemp Sanitary Sensor

• NIDUS SENSORS of Riverside, California announces the availability of their new Series 4200 flush diaphragm sanitary pressure transmitters for use in food, beverage and pharmaceutical applications.

Packed in an electron beam welded stainless steel housing, the Model 4200 sensor is designed for 125°C (260°F) steam Clean-In-Place installations and mounts with a Ladish tri-clover pressure fitting.

Available in 1.5" and 2.0" standard diameter mounts and ranges from 0-5 PSI to 0-50 PSI, the 4200 sensor is offered in both sealed and vented gage versions. The electrical circuit is a 2-wire, 4-20 ma process standard with normal 24 vdc excitation.

Accuracy and non-linearity of the 4200 sensor is 0.1% FS at constant temperature. Operating range is -40 to +260°F. NIDUS can also supply 0.05% computer linearized accuracy, using one of their tank inventory systems. These systems compute the volume of linear and non-linear tanks based on inputs from NIDUS and other types of electronic pressure transmitters.

These all-electronic hitemp sensors are intended as replacements for older style pneumatic gages where a computerized update is required for reading multiple tank volume and temperature with on-site specific gravity correction.

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Isoelectric Point Markers

• ICN Biochemicals has introduced four sets of isoelectric point marker protein for the determination of pH gradients in isoelectric focusing separations. These pI markers are mixtures of stable, salt-free, and highly purified lyophilized proteins.

The pI markers are available in pI ranges of 3.5 to 10.6, 2.4 to 5.65, 4.7 to 10.6, and 5.65 to 8.3. The precisely measured pI of the markers have been measured at 4°C and allow a permanent, accurate calibration of sample components. They have been tested for suitability in use with both polyacrylamide and agarose electrofocusing gels. An application protocol is supplied with each marker set.

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Cryogenic Flash Freezer

• Now there is no need to sacrifice the quality of your frozen products to the inadequacies of conventional freezing methods.

The MUL-TI-FREEZ, a cryogenic flash freezer using liquid nitrogen at minus 320°F, will lock in freshness and flavor by freezing your product in seconds rather than hours. Your product will retain its fresh appearance and you'll be able to package it immediately. No more waiting, double handling or freezers jammed with in-process products.

The economically priced MUL-TI-FREEZ, a small 2ft by 3ft table top unit, requires little production space and is economical to operate, typically freezing an 18" x 26" trayful of product for just pennies.

MUL-TI-FREEZ frozen product in seconds will put dollars in your pocket and give your customers top quality product.

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Techmaster, Inc. Introduces Its News "Energymaster Unfired Make Up Air Conversion Unit"

• Your cold weather make-up air units can now operate "Without Using Any Heat" which mean "Without Using Any Fuel".

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3. *Cools* and *Ventilates* the entire plant during the "hot weather season".
4. Moves excessive objectionable heat up to 550' to other areas that can use it.
5. Returns your investment within as little as one half heating season.

These benefits will not only allow you to save up to 100% of your present make up air fuel costs but your future fuel bills as well.

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Real-Time Data For Quality Control

• The new YSI automated analyzer provides rapid real-time answers for both glucose and L-lactate (L-lactic acid) levels throughout the production process--from raw ingredients to finished products.

The Model 2000 uses the same YSI enzyme electrodes that many in the food, biotechnology and pharmaceutical industries have been using for over 10 years in the YSI Model 27 Industrial Analyzer.

The new system measures glucose and L-lactate simultaneously; prints and displays the results in 60 seconds; automatically calibrates itself; and runs 60 samples per hour. The glucose range is 0.00 to 20.0 g/L; the L-lactate range is 0.00 to 2.0 g/L.

Samples require little or no preparation. The user simply presents the sample to the sipping tube, which aspirates enough for analysis. Sixty seconds later both glucose and L-lactate values will be displayed and printed.

The RS-232C port allows direct connection to PCs or other computers. An automatic sample changer is available as an option.

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Alvey Model SL-2S Pot-Pan-Utensil Washer

• Pots and Utensils cleaned fast and economically. The Alvey Model SL-2S pan washer is designed to do the really tough jobs. Fully automatic - makes unit easy to operate. All stainless steel construction assures you of years of dependable service. Free brochure.

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Auburn International Offers Free Video - Shows How Triboflow Broken Bag Detector Solves Industrial Emissions Problems -

• Auburn International, marketer of TRIBOFLOW and Magneflow advanced flow measurement and process control devices, announced today that it has produced a video which features two applications for the TRIBOFLOW Broken Bag Detector. Available free upon request, the video demonstrates how the product solves common industrial emissions control problems at an asphalt plant and a dairy.

In the first application, the TRIBOFLOW Broken Bag Detector is used to help the Harry Crooker asphalt plant in Portland, ME., monitor and control baghouse dust emission levels. The second shows how the Agri-Mark dairy cooperative in Springfield, MA., used the device to prevent milk powder emissions and subsequent productivity loss through baghouse repair downtime.

The TRIBOFLOW Broken Bag Detector measures the flow of particles in a baghouse by detecting the minute electrical charge that is transferred when particles strike a stationary stainless steel probe. This electrical charge is conducted along the steel probe to a unit which amplifies the signal. As the flow of particles striking the probe increases, so the electrical charge increases. Measurement of flow rates in a baghouse can be measured instantaneously and with extreme accuracy on this basis, making the Broken Bag Detector a vital early-warning device in the event of bags tearing or breaking.

Since its inception in 1975, Auburn International has been a pioneer of technology for flow measurement and process control. Auburn clients include: Alcoa; American Tobacco; Dow Chemical; Eastman Kodak; Exxon Chemical; General Foods; Goodyear Tire; Johnson and Johnson; NASA; Pillsbury; Proctor and Gamble; 3M Company; Westinghouse; and Xerox.

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Literature Kit from Eriez Magnetics Describes Metal Detection Equipment for the Food Industry

• Free information kit from Eriez Magnetics provides technical information, specifications and suggested applications for solid state metal detection equipment for the food industry.

Eriez metal detectors sense the presence of all kinds of magnetic and non-magnetic metals in materials conveyed at speeds up to 1000 feet per minute. Brochures detail how the equipment detects unwanted tramp or stray metal in moving bulk material, sheet or web material, or packaged or bagged material.

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New Pheromone Trap

• A pheromone trap is now available for the Drugstore beetle (Stegobium paniceum). Fuji Trap 87 is the name of this unique pheromone trapping system. It is packed in kits that contain 10 traps.

Pheromone traps attract pest insects onto a sticky surface to help detect the presence or absence of pest insect populations. Non-toxic pheromone traps and lures have been developed for over 150 different pest insects including most of the *stored product insects.*

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Colorful New Brochure Describes TAI's Complete Line of Industrial Sensors, Analyzers and Instrument Systems

• This brochure from Teledyne Analytical Instruments is all-new for 1988 and describes the company's product line capabilities for process control, combustion efficiency, pollution abatement, quality assurance, personnel protection, laboratory analysis, and research and development.

Sensors, Analyzers and Systems available from Teledyne include products for measuring percent and trace oxygen; CO/CO2/SO2/NOx and other combustion emissions; combustible gases; oil-in-water; CO in process gases; and a variety of instrumentation for a wide range of gas and liquid chemical analyses.

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Introducing the Silverson Sealed Unit Laboratory Mixer

• Silverson Machines, Inc., manufacturer of high-shear mixing and homogenizing equipment, introduces the Sealed Unit Lab Mixer for highly infective or aseptic conditions.

The Sealed Unit Laboratory Mixer features a quick release mechanism which allows a wide range of sealed mixing units (capacities from 1 ml. to 2 liters) to be rapidly attached or removed.

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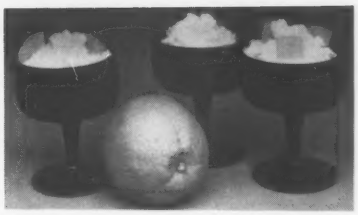

ITC Introduces New Liquid Stabilizer for Cottage Cheese

• Ingredient Technology Corporation has introduced a liquid stabilizer specifically for use in cottage cheese. The new stabilizer, which offers full utilization and ease of handling, is said to improve yield during the manufacture of cottage cheese.

LC-800, produced by ITC's Ingredient Systems Division in Burbank, California, is said to increase product yield by eliminating the agitation foam created during the manufacture and packaging of cottage cheese. According to Robert Causey, the division's technical director, the stabilizer will prevent oxidation and facilitate pasteurization while improving the creaming ratio by as much as 5%.

LC-800 is an Instant Lecithinated Stabilizer (ILS), which is a patented liquid stabilizer system featuring a dispersion of functional stabilizers in a lecithin base. Lecithin, the commercial name for phosphatides -- a naturally occurring substance found in all living cells, has been used by the dairy industry since 1959. Featuring strong emulsifying properties, lecithin is an ideal, water-free carrier for stabilization systems.

Free-flowing at room temperature, LC-800 is light tan in color, devoid of off flavor and contains no water.

Ingredient Technical Corporation, with 21 plants throughout North America, is one of the largest ingredients-only suppliers in the United states. The company provides products and services in 65 ingredient categories to the dairy, baking, food processing confectionery, beverage, and snack food industries. Headquartered in Pelham Manor, New York, ITC shares are traded on the New York Stock Exchange.

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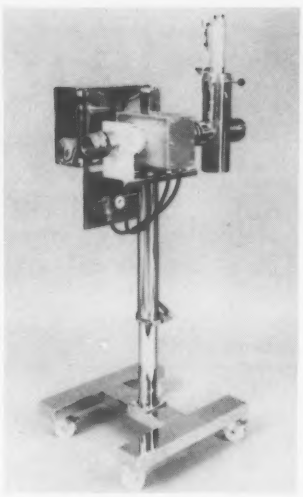

Processors Can Accurately Detect Metal in Viscous Food Products During Pumping with Pipeline System from A.M. Lock, Inc.

• Food processors can inspect viscous products for all types of metallic contamination during pumping while minimizing false rejects, with a new metal detection system from A.M. Lock, Inc., (Tampa, FL).

The Lock Metalchek 9 high pressure pipeline system contains non-metallic throughout pipes and a three-way high pressure reject valve, which permit fault-free inspection of both ferrous and non-ferrous metals in pumped meat slurries. The system performs reliably and accurately up to several hundred pounds per square inch of pressure. In addition, it benefits from a double waterproof liner to withstand high pressure, heavy duty, hot water hose down.

The pipeline system is designed with automatic balance control which permanently eliminates any operator adjustment, minimizes false rejects and ensures long term detection repeatability. It also contains an electronics signal processing module with a two-year warranty that is user-replaceable and requires no operator training, eliminating service calls and system downtime.

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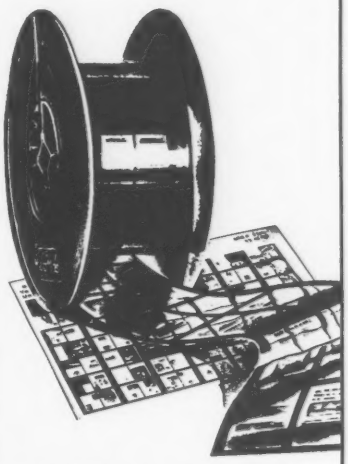

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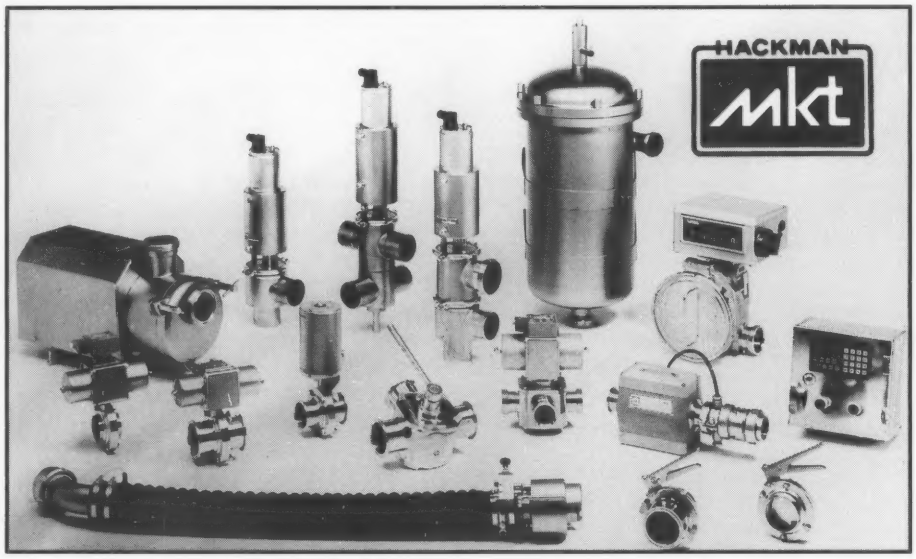

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Food and Environmental Hazards to Health

New Test Helps Guard Against Food Poisoning

A purple dye that lets scientists distinguish between harmless and virulent strains of a bacterium may lead to a new way of detecting organisms that cause food poisoning, an Agricultural Research Service scientist says.

Saumya Bhaduri, an ARS microbiologist at Philadelphia, has found that crystal violet dye binds to disease-causing strains of the bacterium Yersinia enterocolitica but does not affect the harmless strains.

"Our new test will make it easier for industry and regulatory agencies to safeguard food by pinpointing the strains that are virulent," Bhaduri says. "It is simpler, quicker and more reliable than current tests, which are often inconclusive and can take days to complete."

The purple dye works by binding to an unidentified substance produced in Y. enterocolitica strains containing a plasmid--genetic material outside the cell chromosome--that causes a strain to be virulent.

The new test--which takes 3 to 5 minutes--also gives scientists a way to study whether heating, salt, acidity, radiation, or other treatments will eliminate the plasmid in virulent strains.

Y. enterocolitica is emerging as a food pathogen of concern to the Food and Drug Administration and the Center for Disease Control (CDC). It can reach infectious levels in 4 days in mishandled milk, beef, and other meat products and grows at temperatures as low as 32°F, Bhaduri says. Most strains are harmless, but the few strains that are virulent cause classic food poisoning symptoms - abdominal pain, diarrhea, and vomiting.

According to the CDC, there have been several reports of food poisoning from Y. enterocolitica in recent years. The last reported outbreaks were in 1982 - 16 cases in Pennsylvania from tainted bean sprouts and 172 cases linked to contaminated milk in Arkansas, Tennessee, and Mississippi.

Bhaduri says once people eat food contaminated with the organism, it grows in the intestines and produces toxic substances that scientists have yet to identify. These may be what actually cause sickness, but scientists aren't certain.

Through ARS, he has applied for a patent on the test. His findings were reported in the June 1987 issue of the Journal of Clinical Microbiology. - By Sean Adams, ARS.

Saumya Bhaduri is in USDA-ARS Microbial Food Safety Research, Eastern Regional Research Center, 600 East Mermaid Lane, Philadelphia, PA 19118.

Agric. Research 1-88

FDA Rules on OTC Antibiotics

Currently marketed nonprescription first-aid antibiotics are safe and effective for preventing skin infection in minor cuts, scrapes and burns, says FDA. But one antibiotic, gramicidin, has not been proven effective in such products and can no longer be used.

Those findings were published in the December 11, 1987, Federal Register as part of the agency's final rule on over-the-counter first-aid antibiotic products.

Bacitracin, bacitracin zinc, chlortetracycline hydrochloride, neomycin sulfate, and tetracycline hydrochloride are the approved ingredients. Oxytetracycline hydrochloride and polymyxin B sulfate may be used in combination antibiotic products only.

The new standard also allows combining an antibiotic with an anesthetic (painkiller) as a topical first-aid product. Some comments made during the rule-making process suggested that an anesthetic might mask the symptoms of infection, thus delaying treatment by a physician. But FDA called the combination "rational" because the products are not labeled to treat existing infection but, rather, to be used as "first aid" for temporary relief of pain or discomfort in minor cuts, scrape and burns. FDA also noted that there is not a single adverse reaction to antibiotic-anesthetic combination products in its records.

The label on all antibiotic products, including the anesthetic-antibiotic combinations, must warn: For external use only. Do not use in the eyes or apply over large areas of the body. In case of deep or puncture wounds, animal bites, or serious burns, consult a doctor. Stop use and consult a doctor if the condition persists or gets worse. Do not use longer than 1 week unless directed by a doctor.

2/March 1988/FDA Consumer

'SUPERBUGS' May Have Tainted Milk

The largest outbreak of Salmonella food poisoning in U.S. history resulted from milk contaminated with a strain of the bacteria that was antibiotic-resistant, according to a study in the December 11 issue of the Journal of American Medical Association.

The 1985 outbreak was traced to two brands of contaminated 2 percent, low-fat milk produced by the Hillfarm Dairy in Melrose Park, Illinois. There were 16,284 confirmed cases of illness in six midwestern states - although most were in Illinois - with an estimate by the study's authors that between 168,791 and 197,581 persons were actually stricken. Also, the epidemic, they said, probably caused two deaths and may have been related to 12 others.

The pathogen's resistance to a wide variety of antibiotics suggests that the original source of the strain may have been dairy cattle that had been given antibiotics at dairy farms supplying the plant's milk. "Use of antimicrobials on dairy farms can lead to emergence of resistant strains," the researchers said. They also noted that the epidemic strains first appeared in late June 1984, in a patient who routinely bought dairy products from the

supermarket chain that sold the implicated dairy plant's products, and that the strain must have persisted in the plant for almost 10 months.

The unusual strain, Salmonella typhimurium, was identified in the low-fat milk. Although its presence in the dairy plant itself could not be confirmed, the investigation uncovered evidence of defects in some plant operations and equipment. Investigators suspect that contaminated milk was inadvertently blended with milk that had already been pasteurized. (See "Of Microbes and Milk: Probing America's Worst Salmonella Outbreak," February 1986 FDA Consumer.) The plant shut down in April 1985 and has not reopened.

The JAMA study's authors included Caroline A. Ryan, M.D., now of the University of Washington School of Medicine in Seattle, her former colleagues at the federal Centers for Disease Control in Atlanta, and the Illinois Department of Public Health.

FDA Consumer March 88

Intoxication Following Mussel Ingestion in Montreal

Case 1: On 19 November 1987, an 84-year-old male, previously in good health, developed nausea and vomiting 3 1/2 hours after eating mussels at a Montreal restaurant. The next day, he became increasingly confused and was admitted to a large teaching hospital. On admission, he had normal vital signs with a temperature of 38.0°C. Physical examination was unremarkable except for somnolence, disorientation to time and place, short-term memory loss, and perservation. No focal neurologic findings were noted. Laboratory studies revealed a white blood cell count of 10.3 x 10^9/L and normal serum biochemistry, including creatinine and urea nitrogen. Lumbar puncture and CT. scan were isolated from CSF, blood, and other cultures. The WBC rose to 23 x 10^9/L by 24 November. He gradually became comatose, and on 1 December, was transferred to the intensive care unit for ventilatory support. Abnormal movements of the eyes, jaw and upper extremities were noted.

Case 2: A 65-year-old male developed nausea and frontal headache on 29 November 1987, 12 hours after eating mussels at a Montreal restaurant. Twelve hours later, he vomited and noted sweating. The next day the headache persisted and he felt as if he were in a "daze". No medical care was sought and the patient was well by 3 December.

As of 7 December, 37 cases of gastroenteritis following mussel ingestion have been described among residents of greater Montreal. The person with the earliest case was reported to have eaten mussels on 12 November and the last on 1 December. Demographic and epidemiologic data are available for most of these cases. Nineteen of 34 cases (56%) were male, the median age being 65 years (range 31-87 years). Illness followed ingestion of mussels by a median of 4.3 hours (range 0.3 - 56 hours). The onset of illness apparently clustered around 3 weekends.

All patients had nausea with vomiting and abdominal cramps; most also had diarrhea. Eighteen (49%) of the 37 cases had neurological complaints including headache, vertigo, disorientation, memory loss, and confusion, with abnormal signs including ataxia, extraocular and jaw movement, grimacing, coma and seizures. Symptoms and signs referable to the autonomic nervous system including sweating, urinary retention, fluctuations in blood pressure, and tachycardia. Twelve (32%) required hospitalization for more than 24 hours; 10 of these patients were over 60. Two patients had previous chronic renal failure. Eight (67%) of the hospitalized patients were admitted before 22 November.

Of the 28 cases where the mussel origin is known, 26 (93%) ate mussels from Prince Edward Island. Two ate mussels which originated from the *Iles-de-la-Madeleine*. Both had milk gastrointestinal symptomatology and one also had milk neurological complaints. Fourteen restaurants were implicated with all mussels being supplied from Prince Edward Island.

Comment: There have been 78 cases of shellfish intoxication from Prince Edward Island mussels reported nationally as of 0900 hours on 10 December. Thirty-four cases reporting neurological symptoms in addition to gastrointestinal upset ate mussels between 12 November and 1 December. Twenty-five cases have been hospitalized, and at least 8 have required intensive care. Recovery of the most severe cases has been slow. One death has been reported.

The neurological symptoms of P.E.I. mussel intoxication are unlike those seen with paralytic shellfish poisoning (PSP) which has been caused by shellfish from other Canadian waters in the past and which may account for the 2 cases associated with mussels from the *Iles-de-la-Madeleine*. Scientists from the Health Protection Branch, Health and Welfare Canada, Fisheries and Oceans Canada, and a number of affiliated institutions are currently conducting extensive studies to determine the nature of the toxin involved in the P.E.I. mussel.

Can. Dis. Weekly Report 12/12/87

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Affiliate Newsletter

Fifty-six People Attend Nebraska's First Seminar

The Nebraska Association of Milk and Food Sanitarians held their first seminar on April 14 and 15, 1988 at the Hilton Hotel in Lincoln, Nebraska. Fifty-six people were in attendance.

Fourteen very qualified speakers addressed a wide variety of topics pertinent to food and dairy industries, laboratories and regulatory agencies. Dr. Steve Taylor, Chairman of Food Science at UNL, gave a very informative up-date on the problem of sulfites in foods and adverse reactions some people have. Melodee Blobaum of the Dairy Council of Central States, explained the steps of crisis communication and what happens when a product becomes contaminated. Kathleen Leddy of the Standards and Labeling Division of the USDA explained rules governing the labeling of meat products.

A business meeting was held the second day. A constitution and by-laws were passed and new officers chosen. Serving this term will be President, Dr. Richard Brazis; President-Elect, Nancy Bremer; Secretary-Treasurer, Dirk Shoemaker. It was voted upon to apply for a charter to become an affiliate of the International Association of Milk, Food and Environmental Sanitarians. A committee was appointed to determine the best time of year to have the next seminar and meeting.

Authors Wanted

Dairy and Food Sanitation is looking for individuals interested in writing articles for our journal. If you are interested, please contact IAMFES for more information,
P.O. Box 701
Ames, IA 50010
Attn: Margie Marble

Upcoming IAMFES Affiliate Meetings

1988

September 16, GEORGIA ASSOCIATION OF FOOD AND ENVIRONMENTAL SANITARIANS will hold a fall symposium at the Holiday Inn, Decatur, Georgia. For more information, contact: Steve Petrides, GAFES Secretary, Division of Environmental Health, 3651 Market St., Clarkston, GA 30021, (404) 292-1979.

September 20-21, WISCONSIN ASSOCIATION OF MILK AND FOOD SANITARIANS JOINT EDUCATIONAL CONFERENCE, will be held at the Ramada Inn, 2325 Bainbridge Rd, LaCrosse, WI 54601. For more information, contact: Ron Buege, West Allis Hlth Dept., 7120 W. National Ave., West Allis, WI 53214, (414) 256-8360.

September 26-28, INDIANA ENVIRONMENTAL HEALTH ASSOCIATION, INC., annual fall meeting will be held at the Hilton in Fort Wayne, Indiana. The contact person is Rosemarie Hansell, Marion Co. Hlth Dept., 222 East Ohio St., Indianapolis, IN 46204, (317) 633-9682.

September 27-29, NEW YORK STATE ASSOCIATION OF MILK AND FOOD SANITARIANS annual meeting, will be held at the Sheriton Inn-Binghamton at Sarbro Square, One Sarbro Square, Binghamton, NY. For more information, contact: Paul Dersam, 27 Sullivan Rd, Alden, NY 14004, (716) 937-3432.

September 29-30, SOUTH DAKOTA STATE DAIRY ASSOCIATION, will hold its annual convention at the Holiday Inn, Brookings, SD. For additional information, contact: Shirley W. Seas, Dairy Science Dept., SD State Univ., Brookings, SD 57007, (605) 688-5480.

October 6, OHIO ASSOCIATION OF MILK, FOOD & ENVIRONMENTAL SANITARIANS FALL MEETING, will be held in Columbus, OH. For more information, contact D. L. Barrett, 614-222-6195.

October 18-19, CALIFORNIA ASSOCIATION OF DAIRY & MILK SANITARIANS CONFERENCE, to be held at the Concord Hilton Hotel, Concord, CA. For more information, contact: Jack Coppes, Executive Secretary, PO Box 9234, Whittier, CA 90608, (213) 699-4313.

November 1-3, NORTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION ANNUAL FALL CONFERENCE, to be held at the Holiday Inn, Minot, ND. For more information, contact: Peri Dura (701) 224-2382.

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To check the accuracy of their testing equipment, many laboratories use a set of standardized samples from an outside source for fat, protein and somatic cells. In addition, performance of their equipment is monitored continuously, with microscopic counts performed at the lab on high, low and medium range somatic cell milk.

Obviously, the best way to obtain good testing results is for your milk to be low in somatic cells in the first place. Counts of from 100,000 to 200,000 somatic cells per milliliter are possible, and such counts would earn you a bonus under most programs. However, good milking and cow management are required to achieve desired results.

Milking management includes good cow preparation, milking clean and dry udders, clean environment and good cowside sanitation. Dip teats following milking using a product which has been shown to be effective in preventing new udder infections. Testing by protocols A, B and C are recommended to show effectiveness.

Milking machine management involves maintenance by a professional with the system under load at the time of checking.

Dry cow treatment is recommended for every quarter of every cow at drying off. Use a commercial product designed for dry cow treatment. Obviously, controlling mastitis is one of the first steps in earning quality bonuses. Cull chronic animals that are a reservoir of infection and that are continually raising your bulk tank somatic cell count.

It is rare that high bacteria counts are caused by mastitis. Usually the cause is poorly cleaned and sanitized equipment.

Dairymen sometimes point out that they don't do a particular practice "by the book," but don't have any mastitis problems and make the bonus every time. And it happens. But a general rule of thumb is: The more procedures done correctly, the stronger your program is and the more difficult it is to get into trouble. The reverse is true, also: The fewer things done correctly, the easier it is to experience difficulties. Remember, your system is no stronger than your weakest practice.

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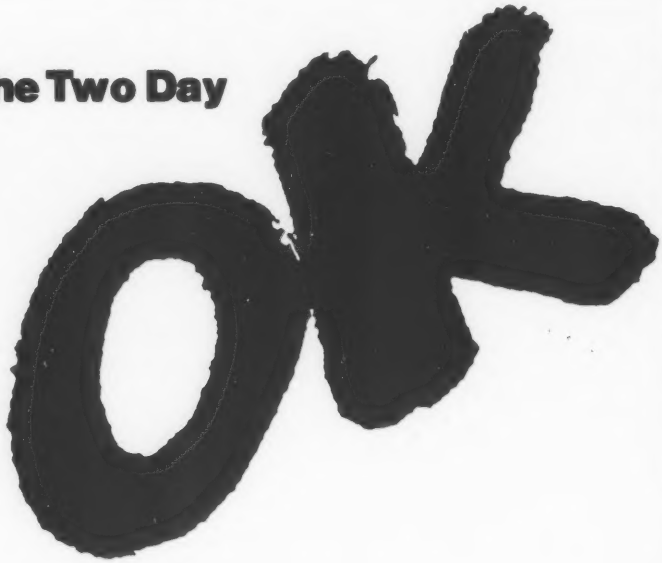

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To receive the* Journal of Food Protection *in its entirety each month call 1-800-525-5223, ext. A or 515-232-6699, ext. A in Iowa.

Fate of *Listeria monocytogenes* on Ready to Serve Lettuce, E. G. Steinbruegge, R. Burt Maxcy and Michael L. Liewen, Department of Food Science and Technology, University of Nebraska-Lincoln, Lincoln, Nebraska 68583-0919

J. Food Prot. 51:596-599

The ability of *Listeria monocytogenes* to survive and grow on head lettuce obtained from a retail outlet over a period of 10 months was determined. Lettuce was torn into bite sized pieces, inoculated with *L. monocytogenes* ATCC 7644, placed into plastic bags, and held under a variety of storage conditions. Samples stored at 5°C and 12°C were subjected to aerobic plate count analysis, and levels of *L. monocytogenes* were determined immediately after inoculation and after 7 and 14 d of storage. Samples stored at 25°C were sampled after inoculation and after 4 and 8 h storage. Lettuce juice was inoculated, stored at 5°C and sampled as described for head lettuce. Aerobic plate counts on lettuce stored at 5°C and 12°C increased greatly during the 14 d of storage. Behavior of *L. monocytogenes* was variable. In most trials, numbers increased by several log cycles during 14 d of storage, but in several trials growth never occurred or did not persist for 14 d. The same general growth patterns were observed in lettuce held at 25°C. Aerobic plate counts increased by 1 or 2 log cycles and *L. monocytogenes* increased by 1 log cycle, except for occasional trials where the organisms did not grow or survive. Lettuce juice held at 5°C was also able to support growth of *L. monocytogenes*. *L. monocytogenes* serotype 1 was isolated from some uninoculated samples indicating that the organism was naturally present on some of the lettuce heads purchased from retail outlets.

Behavior of *Listeria monocytogenes* in Skim Milk during Fermentation with Mesophilic Lactic Starter Cultures, Michelle M. Schaack and Elmer H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 51:600-606

The ability of *Listeria monocytogenes* to grow and compete with mesophilic lactic acid bacteria was examined. Autoclaved skim milk was inoculated with 10^3 cells of *L. monocytogenes* (strain V7 or Ohio)/ml, and with 5.0, 1.0, 0.5 or 0.1% of a milk culture of either *Streptococcus cremoris* or *Streptococcus lactis*. Inoculated milks were fermented for 15 h at 21 or 30°C, followed by refrigeration at 4°C. Samples were plated on McBride Listeria Agar to enumerate *L. monocytogenes* and on either APT Agar or plate count agar to enumerate lactic acid bacteria. *L. monocytogenes* survived in all fermentations, and commonly also grew to some extent. Incubation at 30°C with 5% *S. lactis* as inoculum appeared to be the most inhibitory combination for strain V7, causing 100% inhibition in growth based on maximum population attained. *S. cremoris* at the 5.0% and 0.1% inoculum levels, was slightly less inhibitory to *L. monocytogenes* at 37°C, but it was slightly more inhibitory to *L. monocytogenes* at the 1.0% inoculum level than was *S. lactis*. In general, *S. lactis* reduced the pH of fermented milks more than did *S. cremoris*. The population of *L. monocytogenes* began to decrease before 15 h in only one test combination, which was use of a 5.0% inoculum of *S. cremoris* and 30°C incubation. In most instances, growth of the pathogen appeared to be completely inhibited when the pH dropped below 4.75.

Behavior of *Listeira monocytogenes* in Skim Milk and Yogurt Mix during Fermentation by Thermophilic Lactic Acid Bacteria, Michelle M. Schaack and Elmer H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin, Madison, Wisconsin 53706

J. Food Prot. 51:607-614

Behavior of *Listeria monocytogenes* in skim milk and in yogurt mix during fermentation with thermophilic lactic starters was determined. Sterile skim milk was inoculated with ca. 10^3 *L. monocytogenes* cells/ml and with 5.0, 1.0 or 0.1% of a milk culture of *Streptococcus thermophilus, Lactobacillus bulgaricus* or a mixture of the two species. The milk was incubated at 37 or 42°C for 15 h, followed by refrigeration at 4°C. Yogurt mix was inoculated with ca. 5×10^3 *L. monocytogenes* cells/ml of mix and then was incubated at 45°C for 5 h, followed by refrigeration at 4°C. *L. monocytogenes* survived the 15-h fermentation with *S. thermophilus* in all combinations of level of inoculum and temperature of incubation, but inhibition of growth ranged from 96 to 100%. When incubated with *L. bulgaricus, L. monocytogenes* survived only between 9 and 15 h of incubation; a decrease in pH to below 4.0 was accompanied by rapid death of the pathogen. The combination of the two species was more inhibitory to *L. monocytogenes* than was *S. thermophilus* alone but less inhibitory than was *L. bulgaricus* alone. In yogurt mix, *L. monocytogenes* grew during the fermentation and increased in number by about one order of magnitude.

Survival of *Listeria monocytogenes* in Cold-Pack Cheese Food During Refrigerated Storage, E. T. Ryser and E. H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 51:615-621

Duplicate lots of cold-pack cheese food were manufactured according to nine different formulations, inoculated to contain ca. 5×10^2 *Listeria monocytogenes* (strains Scott A, V7, California or Ohio) colony forming units (CFU)/g and stored at 4°C. *L. monocytogenes* in cheese food was enumerated by surface-plating appropriate dilutions made in Tryptose Broth containing 2% (w/v) sodium citrate (TBC) on McBride Listeria Agar (MLA). Initial TBC dilutions were stored at 3°C and surface-plated on MLA after 2, 4, 6 and 8 weeks if the organism was not quantitated by direct plating of the original samples. Selected *Listeria* colonies were confirmed biochemically. Populations of *L. monocytogenes* in cheese food manufactured without preservatives or acidifying agents generally decreased less than 10-fold after 182 d of storage. However, numbers of *L. monocytogenes* steadily decreased in cheese food containing 0.30% sorbic acid or 0.30% sodium propionate and which was acidified to pH 5.0 to 5.1 with lactic and/or acetic acid. In cheese food preserved with 0.30% sorbic acid, *L. monocytogenes* survived an average of 130 d in non-acidified cheese food and 112, 93 or 74 d in cheese food acidified with lactic acid, lactic plus acetic acid, or acetic acid, respectively. When 0.30% sodium propionate was substituted for sorbic acid, *L. monocytogenes* survived an average of 142 d in non-acidified cheese food and 118, 103 or 98 d in cheese food acidified with lactic, acetic, or lactic plus acetic acid, respectively.

Temperature, pH, and Strain of Pathogen as Factors Affecting Inactivation of *Listeria monocytogenes* by Chlorine, Souzan E. El-Kest and Elmer H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 51:622-625

Listeria monocytogenes strain Scott-A was treated with 1 ppm available chlorine at different temperatures and pH values. Different strains of *L. monocytogenes* (California, Scott-A and V7) were also exposed to 1 ppm available chlorine at pH 7 and 25°C. The initial population of *L. monocytogenes* was 1×10^8 to 3.2×10^8 CFU/ml of sodium hypochlorite solution. Survival of *L. monocytogenes* was measured by surface-plating (on tryptose agar) samples taken at intervals of 30 s to 1 h of exposure to hypochlorite solution. Larger numbers of *L. monocytogenes* strain Scott-A survived at 25 than at 35°C. The smallest number was observed when cells were exposed to the hypochlorite solution at 5°C. The higher the pH values, in the range of 5 to 9, the greater were the numbers of survivors of *L. monocytogenes* strain Scott-A. Of the strains studied, California was the most resistant, while V7 was the least resistant to the hypochlorite solution.

Comparison of Media and Procedures for the Isolation of *Listeria monocytogenes* from Ground Beef, R. B. Truscott and W. B. McNab, Agriculture Canada, Animal Pathology Laboratory, 110 Stone Rd. W., Guelph, Ontario, N1G 3W4

J. Food Prot. 51:626-628

Eight protocols for the isolation of *Listeria monocytogenes* from meat were used to compare the sensitivity of the Listeria enrichment broth of Donnelly and Baigent (DB) to that of a *Listeria* test broth (LTB) containing horse serum and Tween 80. In addition to *L. monocytogenes*, other *Listeria spp.* were isolated from the majority of lean ground beef samples purchased from 50 retail outlets. Nineteen samples were positive using DB broth while 16 were positive using LTB. This difference was not significant. Neither broth alone recovered all of the 29 positive samples. However, sensitivity was significantly improved when two of the tree protocols were used in parallel. Of 2986 isolates tested for ß-hemolysis in horse blood agar, 654 (21.9%) were positive.

The Effect of Liquid Smoke on *Listeria monocytogenes,* Maria C. Messina, Hamdi A. Ahmad, John A. Marchello, Charles P. Gerba and Michael W. Paquette, Departments of Animal Sciences and Nutrition and Food Science, University of Arizona, Tucson, Arizona 85721

J. Food Prot. 51:629-631

Although no documented outbreaks of listeriosis have been associated with the consumption of meat in the United States, *Listeria monocytogenes* is common to the environment of processing plants. In an effort to control the potential hazard of surface contamination of beef franks with *L. monocytogenes*, five different Red Arrow smoke products were evaluated for their antimicrobial activity in 0.5% and 0.25% smoke preparations against *L. monocytogenes* LCDC 81-861, a serotype 4b strain. In smoke preparations of 0.5%, CharSol-10, Aro-Smoke P-50, and CharDex Hickory were effective in reducing viable cell numbers below detection within 4 h and CharSol PN-9 and CharOil Hickory gave similar results within 24 h. In smoke preparations of 0.25%, CharSol-10 and Aro-Smoke P-50 again demonstrated their strong antimicrobial effects within 4 h, but the activity of CharDex Hickory, CharSol PN-9, and CharOil Hickory are reduced at this concentration requiring 24, 48, and 96 h, respectively, to reduce microbial numbers below detection. Since CharSol-10 demonstrated strong antimicrobial effects against *L. monocytogenes* in pure culture, it was selected as the liquid smoke to be used as a full strength dip treatment for beef franks surface inoculated with 6 strains of *L. monocytogenes* then vacuum packaged and stored at 4±1°C for 72 h. In untreated beef franks, *L. monocytogenes* numbers remained unchanged after 72 h, while beef franks dipped in CharSol-10 liquid smoke exhibited a greater than 99.9% reduction in *L. monocytogenes* numbers after 72 h of storage.

Detection of Antibiotic Residues in Consumer Milk Supplies in North America using the Charm Test II Procedure, D. L. Collins-Thompson, D. S. Wood and I. Q. Thomson, Department of Environmental Biology, University of Guelph, Guelph, Ontario N1G 2W1

J. Food Prot. 51:632-633

Two hundred and fourteen consumer milk samples from across North America were examined for antibiotics residues by means of the *Bacillus stearothermophilus* disc assay (Charm test) and the competitive isotopic (Charm Test II) procedure. Of the 174 samples taken from 16 states, 150 samples were positive for one or more antibiotics. The greatest number of positives were sulphamethazine (*82*) and tetracycline (*48*). Canadian samples (*40*) also showed the same problem related to tetracycline (*12*) and sulphamethazine residues (*12*). The *Bacillus stearothermophilus* disc assay procedure was unable in most cases to detect these residues possibly due to the lower sensitivity of this test. Further comparative tests between Charm Test II and other methods of similar sensitivity are recommended to confirm these findings.

Survial and Growth of *Aeromonas hydrophila, Vibrio parahaemolyticus,* and *Staphylococcus aureus* on Cooked Mince and Surimis made from Atlantic Pollock, Steven C. Ingham and Norman N. Potter, Department of Food Science, Corenll University, Ithaca, New York 14853

J. Food Prot. 51:634-638

Mince, salt-added surimi, and low-salt surimi prepared from Atlantic pollock had significantly ($p<0.01$) different protein and NaCl levels. These three products were steamed 16 min, cooled and inoculated with *A. hydrophila, V. parahaemolyticus,* or *S. aureus*. Samples inoculated with *A. hydrophila* were stored at 5, 13, and 25°C; all other samples were stored at 5 and 25°C. *A. hydrophila* grew well on the mince and low-salt surimi but not on the salt-added surimi stored for 5 d at 5°C, 36 h at 13°C and 27 h at 25°C. Populations on the mince and low-salt surimi increased $\log_{10}$ 3.0 CFU/g at 5 and 13°C, and $\log_{10}$ 5.0 CFU/g at 25°C. *V. parahaemolyticus* counts decreased slightly on all three products during 48 h storage at 5°C. At 25°C *V. parahaemolyticus* counts initially decreased on all three products but by 27 h rose at least $\log_{10}$ 2.0 MPN/g on the mince and salt-added surimi. Counts on the low-salt surimi rose $<\log_{10}$ 1.0 MPN/g after the initial decrease. *S. aureus* counts did not increase on any of the products stored for 5 d at 5°C. During 27 h storage at 25°C, *S. aureus* counts were consistently at least $\log_{10}$ 0.9 CFU/g higher on the surimis than on the mince, with highest counts on the low-salt-surimi. These results indicate that compositional differences, including NaCl levels, between surimis and fish flesh used in their preparation can affect pathogen growth.

Substrates Used by *Brochotrix thermosphacta* When Growing on Meat, Frederick H. Grau, CSIRO Division of Food Research, Meat Research Laboratory, Cannon Hill, Queensland 4170, Australia

J. Food Prot. 51:639-642

Substrates used by *Brochothrix thermosphacta* when growing aerobically on meat include glucose, ribose, glycerol, glycerol-3-phosphate and inosine. Glycogen and inosine-monophosphate are not used. Of these substrates, only glucose and ribose are metabolized during anaerobic growth. Ribose is probably the major energy source for anaerobic growth on high pH meat.

Growth of Psychrotrophic Bacteria in Solids Fortified Skim Milk, Dong K. Jeong and Joseph F. Frank, Department of Food Science and Technology, University of Georgia, Athens, Georgia 30602

J. Food Prot. 51:643-647

The effect of fortifying skim milk with non-fat dried milk on growth and proteolysis of psychrotrophic bacteria was determined. Raw skim milk of 8.7% total solids was fortified to 10% and 12% total solids and pasteurized. Growth rates of proteolytic psychrotrophic bacteria were determined in these milks during incubation at 4°C. Proteolysis was determined by measuring the concentration of free amino groups throughout the incubation period. Seven of nine psychrotrophic isolates grew to greater numbers in the fortified milks during the early log phase of growth than they did in the unfortified milks. Growth stimulation was slight in most cases, however, one isolate exhibited a ten-fold increase in numbers when growing in the 10% solids fortified milk. The greatest increases in growth were observed when comparing unfortified milk to milk at 10% solids. Early log phase growth in 12% solids milk was often less than in 10% solids milk but still greater than in unfortified milk. All isolates exhibited increased proteolysis in the fortified milks within 48 h of incubation. These results indicate that increasing the solids content of skim milk with non-fat milk powder produces a microbiological growth medium more suitable for growth and protease production for selected psychrotrophic bacteria.

Enumeration of Aerobic Spore-Formers and *Bacillus cereus* in Meat Product Additives, Kunihiro Shinagawa, Hirotaka Konuma, Masakazu Tokumaru, Niro Takemasa, Masayuki Hashigiwa, Tamotsu Shigehisa and Carlos A. M. Lopes, Department of Veterinary Medicine, Iwate University, Morioka, Iwate 020, Japan

J. Food Prot. 51:648-650

Microbial populations in 225 samples of meat product additives including spices, seasoning, proteins, starch, salt, sugar and colorants, were enumerated by means of aerobic plate counts (APC), aerobic spore counts (ASC), *Bacillus cereus* total counts (BcTC), and *B. cereus* spore counts (BcSC). Our data indicate that meat product additives with the exception of sugar and salt were contaminated mainly by aerobic spore-formers including *B. cereus* under spore-forming conditions. To improve the quality of meat products, it will be necessary to develop methods to reduce the bacterial contamination of meat product additives.

Growth Response of Putrefactive Anaerobe 3679 to Combinations of Potassium Sorbate and Some Common Curing Ingredients (Sucrose, Salt, and Nitrite), and to Noninhibitory Levels of Sorbic Acid, Irene E. Ronning and Hilmer A. Frank, Department of Food Science and Human Nutrition, University of Hawaii, Honolulu, Hawaii 96822

J. Food Prot. 51:651-654

The effects of some common curing ingredients (sucrose, sodium chloride, and nitrite) on sorbate-induced inhibition were tested in putrefactive anaerobe (PA) 3679, a proteolytic species of *Clostridium*. A noninhibitory concentration (1%) of sucrose was not synergistic with the inhibitory action of potassium sorbate (30 mM; pH 6). The effect of sodium chloride depended upon the concentration used; a combination of 3% NaCl and sorbate (30 mM; pH 6) was more inhibitory than either compound alone but 1% NaCl reduced the inhibitory action of sorbate (30 mM; pH 6). Combining a noninhibitory concentration of nitrite (100 μM) and sorbate (30 mM; pH 6) was bactericidal to PA 3679. Nitrite raised the intracellular pH (pH_i) and increased the protonmotive force (PMF) of untreated and sorbate-treated cells. Growth of PA 3679 was stimulated by the addition of a noninhibitory level of undissociated sorbic acid (5.5 mM; pH 7) or 0.1% glucose (5.5 mM) to a nutrient-deficient medium (0.25% Trypticase [BBL]) but growth initiated more rapidly when sorbic acid was added than when the medium was supplemented with glucose. Results of this study are discussed in relation to the possible mechanisms of preservative action and suggest that certain recent changes in methods of food processing and packaging may increase the possibility of growth of clostridial organisms, including *Clostridium botulinum*.

The Incidence of *Listeria* Species in Frozen Seafood Products, Stephen D. Weagant, Patricia N. Sado, Karen G. Colburn, James D. Torkelson, Fred A. Stanley, Mary H. Krane, Sue C. Shields and Charles F. Thayer, U.S. Food and Drug Administration, Room 5009, Federal Office Building, 901 1st Avenue, Seattle, Washington 98174

J. Food Prot. 51:655-657

Samples of frozen seafood products from several countries were tested for the presence of *Listeria monocytogenes* and other *Listeria* species using the U.S. Food and Drug Administration (FDA) *Listeria* isolation method. Of 57 samples tested, 35 contained *Listeria* species and 15 of 57 samples contained *L. monocytogenes*. Samples found positive included raw shrimp, cooked and peeled shrimp, cooked crabmeat, raw lobster tails, langostinos, scallops, squid and surimi-based imitation seafoods. Positive samples were obtained from nine different countries around the world.

Evaluation of the 3M Petrifilm™ Culture Plate Method for Enumerating Aerobic Flora and Coliforms in Poultry Processing Facilities, J. S. McAllister, M. P. Stadtherr and T. L. Fox, Medical-Surgical Division, Central Research Analytical Riker Laboratories, 270-3N-04 3M Center, St. Paul, Minnesota 55144

J. Food Prot. 51:658-659

Petrifilm™ methods were compared to traditional plating methods for monitoring microbial contamination in poultry processing facilities. No differences were seen between the Petrifilm methods and conventional method for enumeration of total bacterial populations, and no trends were seen in the ability of either method to detect coliforms in naturally contaminated samples. When processed poultry products were artificially inoculated with a variety of microorganisms, no difference in efficiency of recovery of the bacteria was noted. The Petrifilm methods were shown to be a practical and accurate alternative for monitoring microbial levels in poultry processing facilities.

Survey of the Microbial Quality of Dry Fish, Cassava and Okra in Ghana, John Y. Lu, Ralphenia D. Pace and Wisdom D. Plahar, Department of Home Economics, School of Agriculture and Home Economics, Tuskegee University, Tuskegee, Alabama 36088

J. Food Prot. 51:660-662

A microbial profile of dry foods in Ghana including smoke dried herrings, salt dried tilapia, salt dried trigger fish, gari, kokonte and okra was evaluated. Okra had the highest aerobic count of 42 x 10^6, followed by kokone 16-20 x 10^4, smoke dried herrings 0.24 x 10^4, salt dried tilapia 3-4 x 10^3, salt dried trigger fish 3-44 x 10^2 and gari 3-34 x 10^2. Anaerobic count was low for all the samples except smoke dried herrings 7-9.5 x 10^2. Differences in mold count was not evident ranging from 2 x 10^2 to 39 x 10^3 for all samples. *Aspergillus* and *Penicillium* were the predominant molds. Coliform count was low for salt dried fish and gari, but higher for smoke dried herrings 2-25 x 10^2, kokonte 11-29 x 10 and okra 31-47 x 10^2.

Risks of Practices, Procedures and Processes that Lead to Outbreaks of Foodborne Diseases, Frank L. Bryan, Food Safety Consultation and Training, 2022 Lavista Circle, Tucker, Georgia 30084

J. Food Prot. 51:663-673

Factors that contributed to outbreaks of foodborne diseases reported in the U.S. from 1977-1982 are identified and classified by disease and place where implicated foods were mishandled. Data for these years are tabulated and combined with data from the years 1961-1976. Inadequate cooling - either leaving foods at room or warm outside temperatures or storing them in large containers while being refrigerated - was associated with most of the outbreaks. Ranking of all factors has changed little over four periods of review, but during the last period numerous outbreaks primarily due to ingestion of raw clams and raw oysters caused an increase in the factors: contaminated raw foods and obtaining foods from unsafe sources. This has been primarily due to raw clam-, oyster- and milk-associated outbreaks. The three most frequently identified factors that contributed to salmonellosis were improper cooling, contaminated raw products, and inadequate heating; to staphylococcal food poisoning were colonized persons handling cooked foods, lapse of 12 or more hours between preparing and eating, and improper cooling; to botulism were inadequate heat processing, improper fermentations, improper room temperature holding; to *C. perfringens* enteritis were improper cooling, lapse of 12 or more hours between preparing and eating, and inadequate reheating (followed closely by improper hot holding); to shigellosis were colonized persons handling implicated foods, improper cooling, and lapse of 12 or more hours between preparing and eating; to *V. parahaemolyticus* gastroenteritis were contaminated raw ingredients, improper cooling, and cross contamination; to typhoid fever were colonized persons handling implicated foods, lapse of 12 or more hours between preparing and eating, and several time-temperature factors tied for third; to *B. cereus* gastroenteritis were improper cooling, lapse of 12 or more hours between preparing and eating, and improper hot holding. The principal factors associated with outbreaks stemming from foods prepared in foodservice establishments were improper cooling, lapse of 12 or more hours between preparing and eating, colonized persons handling implicated foods, inadequate reheating and improper hot holding. Important factors that contributed to outbreaks in homes were contaminated raw foods, inadequate cooking, unsafe source, improper cooling, and lapse of 12 or more hours between preparing and eating. Major contributing factors associated with operations in food processing plants were inadequate heat processing, contaminated raw ingredient, improper cooling, colonized persons handling implicated foods, improper cleaning of equipment, and improper fermentation. Those factors cited above for each category are the vital few items to stress in food safety programs. The many other items that are a part of food protection programs are of lesser importance or trivial.

Authors Wanted

Dairy and Food Sanitation is looking for individuals interested in writing articles for our journal. If you are interested, please contact IAMFES for more information,
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Calendar

1988

September 7-8, ANNUAL CONFERENCE OF THE NORTH CENTRAL CHEESE INDUSTRIES ASSOCIATION, South Dakota State University, Brookings, SD. For further information, contact: E.A. Zottola, Sec-Trea., NCCIA, PO Box 8113, St. Paul, MN 55108.

September 11-13, NATIONAL DAIRY COUNCIL OF CANADA ANNUAL CONFERENCE, to be held at the Winnipeg Convention Centre, Winnipeg, Manitoba. For more information, contact: Pat MacKenzie, 141 Laurier Avenue West, Ottawa, Ontario, Canada K1P-5J3.

September 11-14, SOUTHERN ASSOCIATION OF DAIRY FOOD MANUFACTURERS, INC. 74TH ANNUAL CONVENTION, to be held at the Boca Raton Hotel & Club, Boca Raton, FL. For more information, contact: John E. Johnson, P.O. Box 1050, Raleigh, NC 27605.

September 12, PESTICIDE APPLICATOR CERTIFICATION SEMINAR, Okumura Biological Institute, Clarion Hotel, Sacramento, CA. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 (916) 421-8963.

September 13-15, SPECIAL PROBLEMS IN MILK PLANTS COURSE, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians. To be held at the Howard Johnson Plaza So., IH 35 at Woodward, Austin, TX. For more information, contact: Janie Park, TAMFES, PO Box 2363, Cedar Park, TX

September 14-16, AACC - SENSORY EVALUATION OF FOOD, to be held in St. Paul, Minnesota. For information, contact: AACC Short Course Program, 3340 Pilot Knob Rd, St. Paul, MN 55121 (612) 454-7250.

September 15-16, WISCONSIN LABORATORY ASSOCIATION ANNUAL EDUCATION CONFERENCE, will be held at the Paper Valley Hotel and Conference Center, Appleton, Wisconsin. Contact: Gary Jansen, Pabst Brewing Co., Box 706, Milwaukee, WI 53201 (414) 223-3574.

September 16, GEORGIA ASSOCIATION OF FOOD AND ENVIRONMENTAL SANITARIANS, will hold a fall symposium entitled: 'Seafood and Public Health.' The meeting will be held at the Holiday Inn, I-20 East, Snapfinger Woods Drive, Decatur, Georgia. For more information contact: Steve Petrides, Dekalb County Environmental Health, 3651 Market St., Clarkston, GA 30021 (404)292-1979.

September 19-20, POULTRY HEALTH SEMINAR, to be held at the Raddison Hotel, Atlanta, Georgia. For more information, contact: Southeastern Poultry & Egg Association, 1458 Church St., Decatur, GA 30030, (404) 377, 6465.

September 20-21, WISCONSIN ASSOCIATION OF MILK AND FOOD SANITARIANS JOINT EDUCATIONAL CONFERENCE, to be held at the Ramada Inn, 2325 Bainbridge Rd, LaCrosse, WI 54601. For additional information about the conference, contact: Ron Buege, West Allis Health Dept., 7120 West National Ave., West Allis, WI 53214, (414) 256-8360.

September 21-22, UNITED DAIRY INDUSTRY ASSOCIATION ANNUAL MEETING, to be held at the Hyatt Regency Minneapolis, Minneapolis, Minnesota. For more information, contact: Edward A. Peterson, 6300 N. River Rd., Rosemont, IL 60018.

September 21-22, FIRST ANNUAL MEHA FOOD CONFERENCE, PROBLEMS AND SOLUTIONS, to be held at the Harley Hotel in Lansing, Michigan. For more information, contact: Ike Volkers, Michigan Dept. of Public Health, 3500 N. Logan, PO Box 30035, Lansing, MI 48909 (517) 8268.

September 21-22, VIRGINIA DAIRY QUALITY CONTROL CONFERENCE, to be held at the Sheraton Red Lion Inn, Blacksburg, Virginia. Sponsored by the Virginia Dairy Products Assoc. For more information, contact: J. Russell Bishop, Food Science & Technology, Virginia Tech. Univ., Blacksburg, VA 24061 (703) 961-4921.

September 26-28, INDIANA ENVIRONMENTAL HEALTH ASSOCIATION, INC. ANNUAL FALL MEETING, to be held at the Hilton Inn in Fort Wayne, IN. For information, contact: Rosemarie Hansel, Marion Co. Health Dept., 222 East Ohio St., Indianapolis, IN 46204 (317) 633-9682.

September 27-29, NEW YORK STATE ASSOCIATION OF MILK AND FOOD SANITARIANS, to hold annual meeting at the Sheraton Inn-Binghamton, Sarbro Square, One Sarbro Square, Binghamton, NY 13901. For more information, contact: Paul Dersam, 27 Sullivan Rd, Alden, NY 14004 (716) 937-3432.

September 29-30, SOUTH DAKOTA STATE DAIRY ASSOCIATION, will hold it's annual convention at the Holiday Inn, Brookings, SD. For more information, contact: Shirley W. Seas, Dairy Science Dept., SD State Univ., Brookings, SD 57007 (605) 688-5480.

October 3-5, CONFERENCE ON LISTERIA MONOCYTOGENES, will be held in Rohnert Park, California. It is sponsored by The Society for Industrial Microbiology. Additional information can be obtained from: Mrs. Ann Kulback, SIM, PO Box 12534, Arlington, VA 22209 (703) 941-5373.

October 8-9, MICROWAVE PROCESSING OF FOOD, sponsored by AACC to be held in San Diego, CA. Information can be obtained by contacting: AACC Short Course Program, 3340 Pilot Knob Rd., St. Paul, MN 55121 (612) 454-7250.

October 9-13, AACC ANNUAL MEETING, to be held at the Hotel InterContinental San Diego, in San Diego, California. For more information, contact: Raymond J. Tarleton, American Assoc. of Cereal Chemists, 3340 Pilot Knob Rd., St. Paul, MN 55121 (612) 454-7250.

October 15, RISK ASSESSMENT, RISK MANAGEMENT AND RISK COMMUNICATIVE STRATEGIES IN FOOD REGULATION. Conference for Food Protection workshop, Grosvenor Resort, Orlando, Florida. Contact: P. Packett, Florida Dept. of Agriculture & Consumer Services, 408 Mayo Bldg., Tallahassee, FL 32399-0800 (904) 488-6336.

October 15-19, MILK INDUSTRY FOUNDATION & INTERNATIONAL ICE CREAM ASSOCIATION ANNUAL CONVENTION & SHOW, to be held at Marriott's Orlando World Center, Orlando, Florida. For more information, contact: John F. Speer, Jr., 888 16th St., NW, Washington, DC 20006.

October 15-19, CONFERENCE FOR FOOD PROTECTION, Grosvenor Resort, Orlando, Florida. Contact: P. Packett, FL Dept. of Agric. & Cons. Svcs, 408 Mayo Bldg., Tallahassee, FL 32399-0800 (904) 488-6336.

October 17-19, BIOTECHNOLOGY PROCESSING ENGINEERING CENTER FOURTH ANNUAL SYMPOSIUM, to be held at the Massachusetts Institute of Technology, Cambridge, Massachusetts. For additional information, contact: MIT, BPEC, Room 20A-207, Cambridge, MA 02139, (617) 253-0805.

October 17-20, ASBESTOS ABATEMENT: FACILITY SURVEY AND BUILDING SYSTEMS, to be held at the University of Florida, Gainesville, FL. For more information, contact: Peggy Cook, University of Florida TREECO Center, Gainesville, FL 32608-4838 (904) 392-9570.

October 18-19, CALIFORNIA ASSOCIATION OF DAIRY AND MILK SANITARIANS CONFERENCE, to be held at the Concord Hilton Hotel, Concord, California. For more information, contact: Jack Coppes, Executive Secretary, PO Box 9234, Whittier, CA 90608, (213) 699-4313.

October 20-22, ASBESTOS ABATEMENT: MANAGEMENT PLANNING, to be held at the University of Florida, Gainesville, FL. For more information, contact: Peggy Cook, University of Florida TREECO Center, Gainesville, FL 32608-4838 (904) 392-9570.

October 24-25, PESTS ASSOCIATED WITH FOOD INDUSTRY AND ENVIRONMENTAL SANITATION SEMINAR, Okumura Biological Institute, Holiday Inn, Elk Grove Village, Il. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 (916) 421-8963.

October 31-November 3, FOOD PROCESSING WASTE CONFERENCE, will be held at the Pierremont Plaza Hotel, Atlanta, Georgia. The conference is sponsored by the Environment, Health and Safety Division, Georgia Tech Research Institute. Additional information can be obtained from Edd Valentine or Chuck Ross, George Tech Research Institute, Economic Development Laboratory, Environment, Health and Safety Division, Atlanta, GA 30332, (404) 894-3412.

November 2, SANITATION WORKSHOP FOR THE FOOD INDUSTRY, Inn at the Park, Anaheim, CA. Presented by the University of California Cooperative Extension with assistance from industry trade associations and food industry personnel. Bacteriological concerns, environmental sampling, cleaning and sanitizing compounds, and regulations will be emphasized. For more information, contact: Kathryn Boor, Food Science and Technology, UCD, Davis, CA 95616 (916) 752-1478.

November 2-4, GUM CHEMISTRY AND TECHNOLOGY, will be held in Chicago, Illinois. For more information, contact: AACC Short Course Program, 3340 Pilot Knob Rd., St. Paul, MN 55121, (612) 454-7250.

November 1-3, BASIC PASTEURIZATION COURSE, to be held at the Viscount-Travel Lodge, 1818 Southwest Freeway, Houston will be sponsored by the Texas Association of Milk,

Food and Environmental Sanitarians. For more information, contact: Janie Park, TAMFES, PO Box 2363, Cedar Park, TX 78641-2363, (512) 458-7281.

November 1-3, NORTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION, annual fall conference to be held in Minot, North Dakota at the Holiday Inn.

November 14-18, HAZARDOUS WASTE SITE SAFETY, held at the University of Florida, Gainesville, FL. For more information, contact: Sharon Baker, Registrar or Michael DeLuz, Program Assistant, TREECO Center - University of Florida, 3900 SW 63rd Blvd., Gainesville, FL 32608 (904) 392-9570.

November 16-18, HAZARDOUS MATERIALS: TRAIN-THE-TRAINER, to be held at the University of Florida, Gainesville, FL. For more information, contact: Sharon Baker, Registrar or Michael DeLuz, Program Assistant, TREECO Center - University of Florida, 3900 SW 63rd Blvd., Gainesville, FL 32608 (904) 392-9570.

November 17, FOOD MICROBIOLOGY UPDATE, to be held at the Holiday Inn Holidome, Sacramento, CA. Contact Kathryn J. Boor, Food Science & Technology, University of California, Davis, CA 95616 (916) 752-1478.

November 21, HAZARDOUS WASTE SITE SUPERVISION, to be held at the University of Florida, Gainesville, FL. For more information, contact: Sharon Baker, Registrar, or Michael DeLuz, Program Assistant, TREECO Center - University of Florida, 3900 SW 63rd Blvd., Gainesville, FL 32608 (904) 392-9570.

November 28-December 1, NATIONAL MILK PRODUCERS FEDERATION ANNUAL MEETING, to be held at the Hilton, Anaheim, California. For more information, contact: James C. Barr, 1840 Wilson Blvd., Arlington, VA 22201.

November 30-December 1, FIELD AND LABORATORY SAMPLING OF FOOD, DRUGS, AND AGRICULTURAL COMMODITIES, to be held in Arlington, Virginia. Course size is limited and on a "first come" basis. To register, first verify space availability by calling or writing AOAC Education Dept., 1111 N 19th St., Suite 210, Arlington, VA 22209, (703) 522-3032.

December 5, PESTICIDE APPLICATOR CERTIFICATION SEMINAR, Okumura Biological Institute, Clarion Hotel, Sacramento, CA. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 (916) 421-8963.

December 6-7, PESTS ASSOCIATED WITH FOOD INDUSTRY AND ENVIRONMENTAL SANITATION SEMINAR, Okumura Biological Institute, Clarion Hotel, Sacramento, CA. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 (916) 421-8963.

December 8-9, ADVANCED COURSE ON PEST RECOGNITION AND FOOD INDUSTRY PROBLEMS, Okumura Biological Institute, Clarion Hotel, Sacramento, CA. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 (916) 421-8963.

December 8-9, STARCH: STRUCTURE, PROPERTIES AND FOOD USES, sponsored by AACC to be held in Chicago, Illinois. Information can be obtained by contacting: AACC Short Course Program, 3340 Pilot Knob Rd., St. Paul, MN 55121, (612) 454-7250.

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January 23-27, INSECT FRAGMENT SEMINAR, Okumura Biological Institute, Clarion Hotel, Sacramento, CA. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 (916) 421-8963.

February 20-22, ABC RESEARCH 15TH ANNUAL TECHNICAL SEMINAR, Hilton Hotel, Gainesville, FL 32608. For additional information, contact: Sara Jo Atwell, (904) 372-0436.

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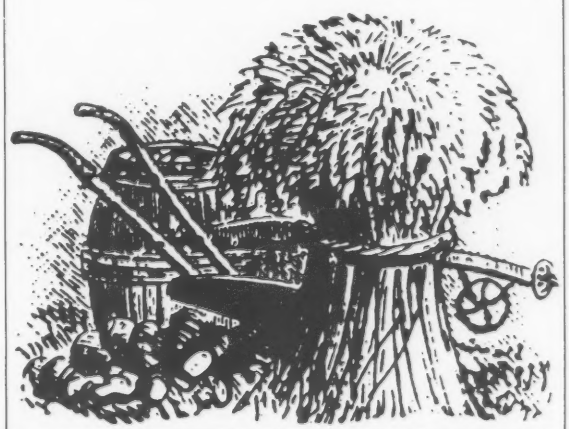

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